Vol. 26 JUNE, 1905 No. 154

THE FOUNDRY

PUBLISHED MONTHLY BY
THE PENTON PUBLISHING CO.
CLEVELAND, OHIO.

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702	"	"	"	best	"	"	high

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No. 702 Pure Ceylon Plumbago, although highest in price at the first cost, is cheapest to use in the long run. It will pay for itself many times over by producing castings from the molds that require no cleaning or dressing.

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"GLUETRIN"

"Fast bind, fast find"

*** GLUETRIN is the best sand binder you can use for either cores or moulds.

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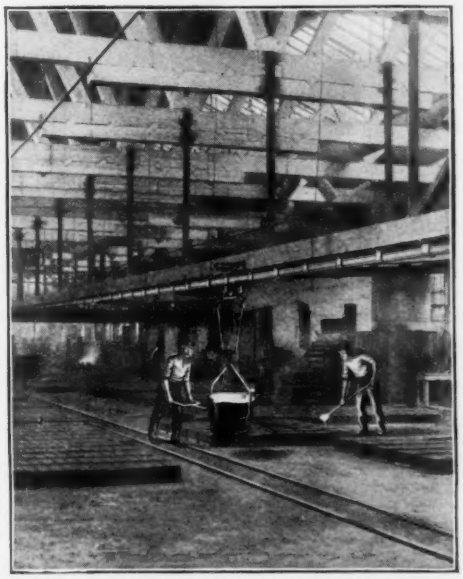

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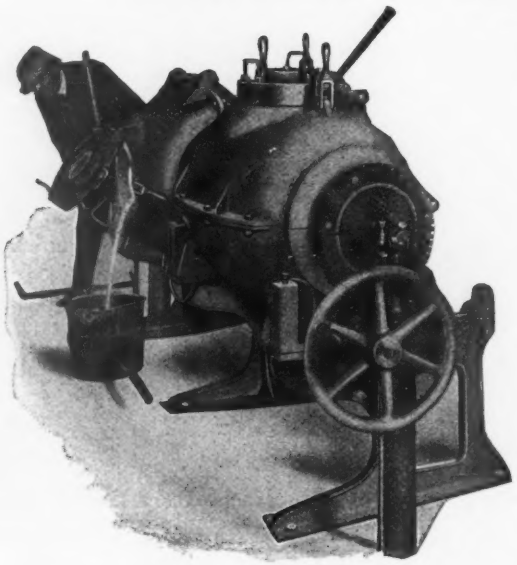

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THE FOUNDRY

Vol. 26, No. 4. *CLEVELAND, OHIO, JUNE 1905.* *Whole No. 154*

Foundry Department of the Imperial Works of the Oil Well Supply Company, Oil City, Pa.

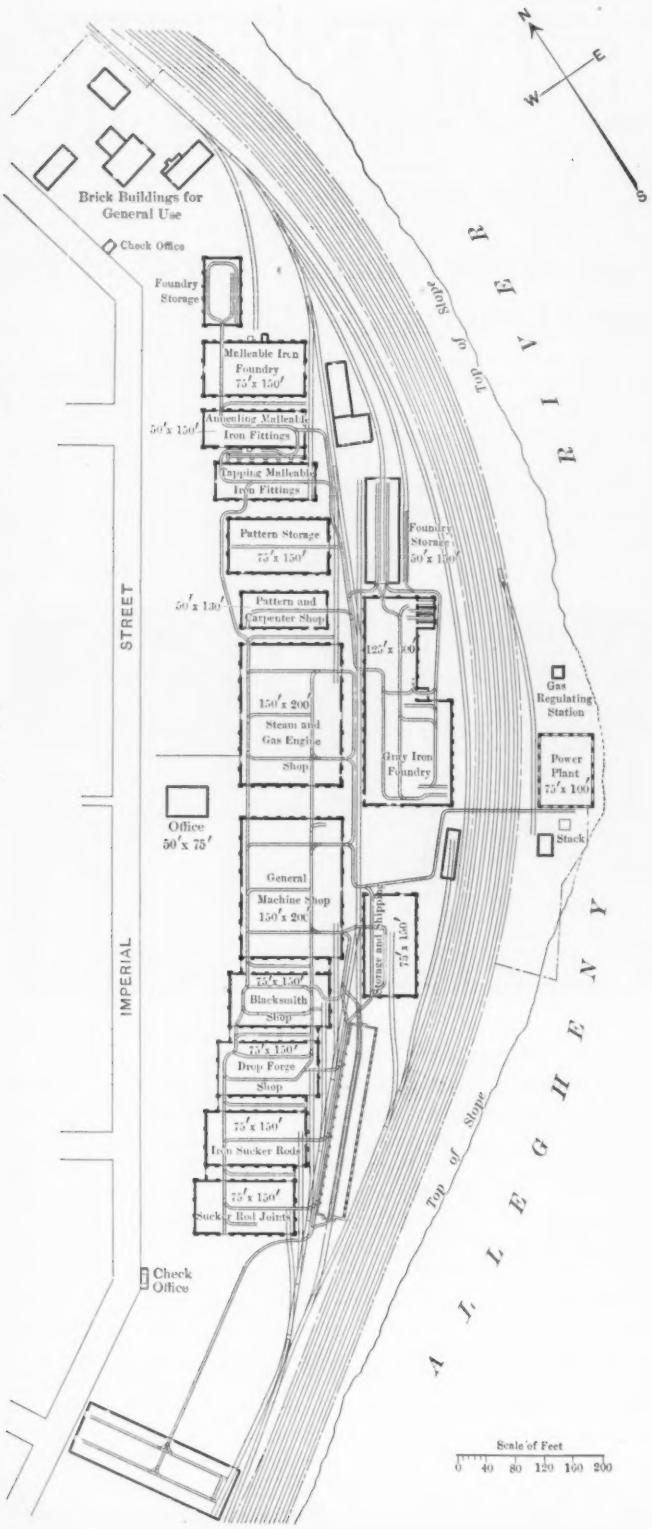
The development of the oil industry in this country has given rise to a number of different lines of manufacture which were formerly unknown. Some idea of the equipment necessary for this industry may be had when we consider that the Oil Well Supply Company has plants at Pittsburg, Oil City and Bradford, Pa.; Oswego, New York; Parkersburg, West Virginia; Van Wert, Ohio and Poplar Bluff, Missouri. The Imperial Works located at Oil City is one of the most complete plants of the kind in the country. No very heavy machine is built at this plant, but there is a large variety of light machine fittings, etc., including pumping rigs for oil wells, steam and oil engines, drilling rigs, and other oil well equipment. The works are located on the bank of the Alleghany river about one mile above Oil City. The general plan has been made to conform to the ground upon which the works are situated, and so the ends of the principal buildings which abut the river form a crescent. This arrangement allows a spur or switch from the railroad to enter each building without passing through any other, as shown in the plan. Each building is also capable of enlargement by extending it at the end away from the river. The shipping department and gray iron foundry are placed between the general switch system and the railroad tracks along the river, as both of these buildings have to do with the work in many other departments. The central power station is located at the bank of the river where it can obtain abundant supply of water for boiler and condensing purposes. The main lines of the Pennsylvania, Lake Shore & Michigan Southern and Erie roads run between the power plant and the other buildings, thus affording ample transportation facilities. The trackage system in and about the works, however, is owned and operated by the company. For switching on the standard gauge system, they have a regular locomotive and for use on the industrial railway a gasoline motor truck. The portion of the plant in which we are especially interested in this article comprises the gray iron and malleable foundries.

STORAGE SHED.

MOLDING MACHINE DEPARTMENT.

Gray Iron Foundry.

The gray iron foundry is located in a build-



ing 125 by 300 feet, with a foundry storage 50 by 150 feet at the end. It consists of a central bay devoted to heavy work. This bay is spanned by a traveling crane running the entire length of the foundry and having a capacity sufficient to handle the largest work they make. The crane also runs over the cleaning department at one end, and in front of the core department at the other. The traveling crane has a 15-ton capacity with a 5-ton auxiliary. Joining the heavy work floor there is a light work floor devoted to snap flask work, or light floor work.

In addition to this there are a number of jib cranes equipped with air hoists. The core department is located at one end of the room and is equipped with a core machine for making stock cores, the necessary benches and boxes for special cores and both large and small core ovens. The core ovens are fired with natural gas.

The cupolas are located about the middle of the length of the foundry and consist of two Whiting cupolas, one 75 inches, and the other 50 inches inside the lining. There is also a 33-inch Collieu cupola. One of the cupolas is arranged to tap either into the main bay, or at right angles into a side room.

The cleaning department is located at one end of the foundry and extends across the entire width of the building. Between the cleaning department and the cupolas there is arranged a large lean-to building or bay, used entirely for machine molding. There is one

MAIN BAY OF GRAY IRON FOUNDRY.

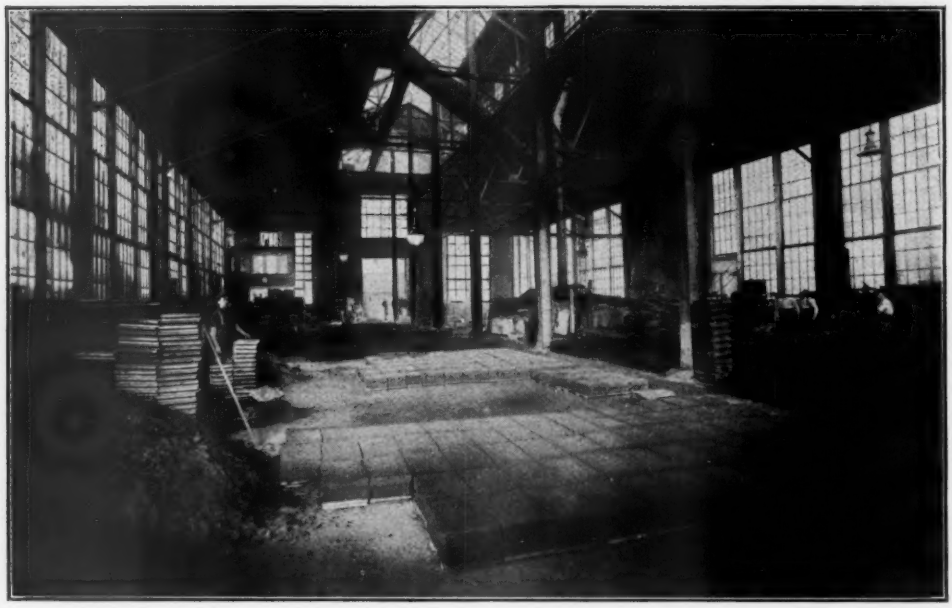
Berkshire automatic molding machine used for small work and a large number of small machines of various types and makes for standard work. In this department there is one feature that is certainly novel. Some of the stripping plate machines are arranged upon long timber foundations at the sides of the building. Trolley tracks are run clear across the building from one machine to the other, and each track is equipped with a large and a small air hoist. One of these is of 800 pounds capacity and the other of 2,500 pounds capacity. The machines on opposite sides are fitted up so that one will make the drags and the other the copes. The heavy hoist places the drags on the floor and the lighter hoist is used in placing the copes. After all of the molds are closed, the large hoist on the next track is swung over, hitched to one of the molding machines and the machine lifted under the next line of trolley track. The hoist then passes to the opposite side of the room and shifts that machine. Both machines are immediately put in operation making copes and drags, and another line of molds across the room completed. The large hoists are also used for pouring, which is accomplished by bringing in a truck ladle on the industrial railway and then lifting it with the heavy hoist and carrying it along over a line of molds. Of course the pneumatic squeezer machines cannot be shifted in this way, but with the stripping plate machines used for heavy work the method serves very well indeed.

The entire foundry is well lighted by side lights, sky lights, and monitor roof.

Storage Provisions.

The pig iron, scrap, etc., together with the larger proportion of the iron flasks not in use are stored in the yard near the cupolas.

One of the most interesting features of the entire plant is the storage building located at the end of the foundry. This is arranged with a standard gauge railway track through the center, a narrow gauge track on each side of it, and a traveling crane above. Suspended from the traveling crane there is a skip or box, and the material as it arrives is loaded into this, hoisted to the top of the bins, and dumped into a movable hopper which can be set opposite any one of the bins. In this way the bins on both sides can be filled with



MALLEABLE FOUNDRY.

any material for which they are intended. The material can then be drawn out into cars on the industrial railway track in the center or into cars running along on the outside of the building. On the outside of the building there is an elevated track on one side from which material can be loaded directly into the bins. The bin capacity is sufficient to store an entire winter's supply of molding sand, sea coal, facing, coke, etc.

Malleable Department.

As this company requires a large amount of malleable fittings and other castings for use in connection with their business it was decided that it would pay to install a malleable iron foundry. This department occupies several buildings. The malleable foundry proper occupies a building 75 by 150 feet and is equipped with one 20-ton air furnace of the ordinary top charged type, such as is generally used in connection with malleable plants. The foreman's office is located in one corner and elevated at such a point that he can look over the entire floor. Under the office is located the metal pattern repair shop, fully equipped for replacing gates and doing any other work necessary for the repair of metal patterns. Adjacent to the metal pattern repair department there is the heating furnace for drying and warming hand ladles, which is certainly a well designed piece of equipment. The construction is plainly shown in one of the illustrations, in which it will be seen that the furnace is simply a rectangular brick structure with some angle irons running lengthwise and some spacing bolts arranged vertically so as to divide the furnace into small rectangular units. A series of plates may be laid in on the angles to form seats for the ladles. One of these plates is standing on top of the furnace and it will be noticed that four small semicircular openings are cut out about the sides to allow the hot gases to pass up about the ladle. The front of each compartment is closed by a casting with a small cast latch which can be swung down over the ladle shank. The furnace can all be taken down and re-assembled in a very few minutes. In the case under consideration a natural gas fire is arranged along the bottom, but there is no reason why the same construction could not be used with a coke or hard coal fire with equally good results. Such a furnace as this would be found very handy in any foundry using a large number of hand ladles. Adjoining the malleable foundry is the hard cleaning room, which is equipped with a battery of exhaust tumbling mills. The castings are then taken to the annealing department which is located in a building 50 by 150 feet. There are five annealing furnaces, all fired with natural gas. The pickling tanks are located in one end of the annealing depart-

1. CHARGING ANNEALING OVENS. 2. HARD CLEANING ROOM. 3. PACKING ANNEALING POTS. THE PICKLING DEPARTMENT CAN BE SEEN IN THE BACKGROUND. 4. LADLE DRYING FURNACE. 5. SMALL CORE DEPARTMENT IN MALLEABLE FOUNDRY.

ment. Adjoining the annealing department is the soft cleaning room, which is equipped with tumbling barrels and other machinery necessary for cleaning soft castings. Such fittings as require galvanizing are taken to the galvanizing department, which is located near the malleable foundry and is equiped with pickling tubs, zinc pot and all the other apparatus necessary.

The cores for malleable fitting constitute a large proportion of the expense necessary for the production of this class of work. For making these cores a very carefully arranged core department has been fitted up in one of the brick buildings which was on the site at the time the present company purchased the old oil refinery property. On the first floor of the department there is located a sand mixing department in which all of the sand is prepared. Many of the heavier cores are also made on this floor. The core ovens are sectional ovens fired with natural gas and are arranged along one side of the building. All of the work on the first floor is done by men and boys.

For making the cores for the smaller fittings girls are employed. They work on the second floor, the core sand being brought up by means of an elevator, and their racks of finished cores being placed on a special elevator which runs continuously. The cores are removed by men on the lower floor and placed in ovens. The plant is so arranged that the girls have a separate entrance to the grounds and no one but their foreman has any business on their floor except those who work there. The room is neat and light.

The entire malleable department shows careful thought in planning and laying out the work so that it can be done to the greatest advantage.

The Mesta Machine Co., of Pittsburg, Pa., has plans prepared for an addition to the big plant at West Homestead which will double its capacity.

METALLOGRAPHY APPLIED TO FOUNDRY WORK.

PART II.

BY ALBERT SAUVEUR.

DEVELOPMENT OF THE STRUCTURE OF POLISHED SAMPLES OF CAST IRON.

When samples of grey cast iron, polished as described in the first installment of this article, are examined through the microscope, numerous, small, irregular cavities are revealed which mark the spaces once occupied by the small particles of graphitic carbon always present in this grade of iron. Most of these graphite particles are removed by the polishing operation but the small cavities which remain indicate accurately their former location and shape. Fig. 1 shows under a magnification of 56 diameters, the appearance of a sample of grey cast iron after polishing. The irregular cavities just referred to, whether they still contain their graphite or not, appear as so many black areas. It will readily be inferred that the appearance of the magnified image of this polished sample of grey cast iron should convey at least as much information concerning the physical and chemical characteristics as the examination of the fracture, or in other words that these properties must be closely related to the number of the graphite particles revealed by polishing, to their size and shape, their distribution, etc. I shall have occasion to show that very valuable information may indeed be obtained from the microscopical examination of polished samples of cast iron without subjecting them to further treatment, but it will be noted that in these samples the structure of the metallic part is not revealed. The polishing operation has imparted the same appearance to the various constituents of which this metallic mass is composed: they have all assumed a mirror-like aspect, reflecting the light to the same extent, so that it is not possible to distinguish them from each other. In order to make these various constituents visible under the microscope it is necessary to impart to them unlike appearances through the action of certain treatments affecting them differently. These treatments generally consist in subjecting the polished samples to the action of acids or of some other reagents which attack certain constituents to the exclusion of others or with varying degrees of intensity: they are generally known as "etching treatments."

Polishing in Relief.—In the case of white cast iron two constituents are present (to be described later) which differ much in hardness and if the tripoli and rouge polishing be continued for a sufficiently long time, and especially if it be conducted on a soft, yielding backing, a pronounced relief effect is produced resulting from the greater wearing of the soft constituent. The difference in level of the two constituents, obtained in this way, differentiate them under the microscope without further treatment.

FIG. 1. GRAY CAST IRON POLISHED BUT NOT ETCHED. MAGNIFIED 56 DIAMETERS.

FIG. 2. WHITE CAST IRON POLISHED IN RELIEF. MAGNIFIED 100 DIAMETERS.

Fig. 2 shows the microstructure magnified 100 diameters, of a sample of white cast iron polished in relief. The presence of two constituents is clearly brought out. The soft constituent appears dark because being somewhat depressed, each particle of it pertains, microscopically speaking, of the nature of a shallow cavity. The differentation is further assisted by the soft constituent assuming a marked appearance, while the hard component retains its specular aspect.

While such relief polishing makes it possible in the case of white cast iron to observe

some features of the structure without further treatment and while it is occasionally valuable, it seldom reveals structural details which are not better brought out by an etching or some other developing treatment.

Etching Methods.—Many reagents have been recommended for etching polished samples of iron and steel, but I shall only describe here those treatments which, so far as my experience goes, yield the best results.

The structure of cast iron may be made apparent by etching polished samples with one of the following solutions: (1) Nitric acid in absolute alcohol, (2) picric acid in absolute alcohol, (3) concentrated nitric acid and (4) tincture of iodine. I have named them in the order of my preference.

Etching with a Solution of Nitric Acid in Alcohol.—A solution should be prepared containing 10 percent of concentrated nitric acid (1.42 sp. gr.) and 90 percent of absolute alcohol. A small amount of this solution should be poured in a small beaker or dish and the polished sample immersed in it for a very short time (seldom exceeding 10 seconds). It is generally better not to leave the sample in the solution for more than five seconds and to repeat the treatment if it be found that the etching was too slight. When the sample is taken from the etching bath, it should be quickly washed in alcohol and carefully dried, preferably by means of an air blast followed by gentle wiping with a soft cloth; or lacking a blast, altogether with a soft cloth.

A piece of chamois leather may also be used to advantage for wiping the specimen, after drying it, immediately before examining it under the miscroscope. To that effect it is convenient to nail a small piece of the leather on a piece of wood and to rub the specimen over it once or twice. This block should be kept carefully covered to prevent any dust from settling upon it.

The etched specimen is now ready for microscopical examination.

Etching with a Solution of Picric Acid in Alcohol.—A solution should be prepared containing 10 percent of picric acid and 90 percent of absolute alcohol and the etching conducted exactly as described for the treatment with nitric acid in alcohol.

Etching with Concentrated Nitric Acid.—The polished samples should be dipped in concentrated nitric acid (1.42 sp. gr.) and immediately held under an abundant stream of running water. When iron is immersed in concentrated nitric acid it assumes what is known as the passive state, i. e., it is not affected by the acid. As soon as the layer of concentrated acid which covers the polished surface, however, is diluted by the running water, it attacks the iron vigorously, but for such a short time (since the water soon removes all traces of acid) that there is very little danger of etching too deeply. One such treatment is generally sufficient to bring out the structure sharply and clearly, but if the sample be found insufficiently etched the etching should be repeated in exactly the same manner.

Etching with Tincture of Iodine.—Some tincture of iodine, such as may be obtained from pharmacists, should be diluted with the same amount of alcohol. A little of this solution should be applied to the polished surface, conveniently by dipping a finger's end in the tincture and gently rubbing the specimen and repeating the treatment until the surface appears dull or slightly tarnished. The sample should then be washed in alcohol and dried.

Heat Tinting Method.—This method consists in heating the polished sample gently and gradually in contact with the atmosphere by holding it over a Bunsen flame for instance, or placing it on a hot plate or in some other suitable manner. The different constituents assume, in rapid succession, but with varying velocities, different shades due to the formation of light films of oxides, in such a way that at no instant of the heating are two components colored alike. This method has been applied extensively and with much success to cast iron by Mr. J. E. Stead and I shall have occasion to again refer to it.

FOUNDRY COSTS.*

BY RALPH BOWMAN.

In analyzing production and in ascertaining the cost, the proposition "per se", is the same with all foundries; but the method must differ with each individual foundry. This is caused by the difference in castings and the varied nature of each foundry's business. "One man's meat being another man's poison" often holds good.

There are three divisions in foundry cost to be considered:

1. The material, or metal, composing the cupola charge.

*Paper read by Ralph Bowman before meeting of Buffalo Foundrymen's Association, March 21, 1905.

2. The general expenses and supplies.
3. The actual molding time of the molder.

The first and third divisions, the material and molding labor, show in themselves what they are. The second division, consists of overhead charges, such as taxes and insurance, or rent, improvements and repairs; contingent or sinking funds to cover depreciation; losses through bad debts, etc., direct charges, such as foreman's wages, wages of cupola tenders, core makers, cleaners, general roustabouts, and the molders' time cutting sand and pouring metal; and also the supplies, sand, facings, riddles, shovels crucibles, flasks, etc.

These divisions having been made and the cost ascertained, the cost of castings may be found in the following manner:

The three divisions are added together and from this sum is deducted the value of the scrap, etc., recovered in gates, spruces and pig-bed. Into this remainder is then divided the total number of pounds of good castings, and the result is the cost, per pound, of the product.

On the other hand, the first two divisions, (that is, the cupola charge and the general expenses and supplies) may be added together and the value of the scrap recovered, deducted from their sum. This remainder may be divided by the number of pounds of good castings, giving, thereby, the cost, per pound, of the metal in the castings. The cost of each individual casting is then found by multiplying its weight by the metal rate, per pound, and adding to the result the molding time of the molder spent on the casting.

Small and light castings would quite likely take the first method, while large, ponderous and heavy castings would very likely take the second.

Therefore, the rules for figuring foundry costs cannot be laid down in a hard and fast manner, a foundry's individuality and the information it desires, necessarily qualifying the method and the form of analysis.

And again, it is debatable to what exact account many items of foundry costs should be charged. General officers' salaries, for instance, may be considered a part of the selling expense. Plant depreciation may go into general expense; or, it may be deducted from net profit (the result being called actual profit). This scheme is frequently all right for a big manufacturing plant; but generally it proves quite wrong for a jobbing foundry. Depreciation may also be taken care of by a sinking fund. I might say here that depreciation is an item which many times lacks consideration and that its disregard cannot be too strongly condemned. Depreciation should be taken care of at every closing of the books. Plants will deteriorate and machinery, kept even in the best order, will become obsolete sometimes, by reason of improvements. The owner, therefore, who does not take this item into account, gives his business at one time credit for more than it is actually doing and, at another time, is unjust to it, when the loss falls in one lump. While on the part of a corporation it is manifestly unfair to ask future stockholders to assume such burdens which a portion of the former dividends should have been retained to cover.

Other overhead expenses, such as losses through bad debts, also deserve consideration and should be arranged for much in the same way as depreciation.

Under direct charges, while new flasks are quite properly charged to Plant Improvements, repairs to flasks, or flask renewals, although taken care of to a certain extent, by depreciation, ought to be charged to the metal. They are really supplies, for flasks are used up like files, some portion being taken by every casting. Again, it may be correct to charge the flask directly to the job for which it is made.

Another debatable item is core-making. As a rule, however, the cost of cores is put into general expense, for it takes a very expensive core indeed to make an appreciable showing.

It is a matter of actual molding, theoretically, the labor should be charged directly to the job, but this is frequently found impractical where the castings are comparatively small and of great variety. Dividing the castings into classes, such as light and heavy, or light, medium and heavy, and keeping track of the molding labor on each class frequently produces satisfactory results. The results from the latter scheme, though, should be checked from time to time by comparison with the cost of actual molding labor on individual castings.

This is the idea, in general, of figuring foundry costs; but, of course, any business analysis cannot end with costs. The question of profit and loss is to be considered.

The cost of the product being known, the cost of the sales is therefore known. The cost of the sales being deducted from the sales, the gross profit appears, and by deducting the selling expense from the gross profit, the net profit is shown.

There is also much to be said of the value of foundry's analysis outside of the bare knowledge of the cost of its product. The results of different formulas of cupola charges, for one thing, are read like a barometer. The labor must account for itself. The expenses tell their own tale. The coke shows how many pounds of metal each pound of it is melting. The leakages appear. Defective castings cannot be hidden. All kinds of molding comparisons are made. Patterns come in for criticism and are sent to the pattern-shop for more draught, to have corners rounded, to be shaped differently and parted in another way so as to save cores, and for all kinds of repairs and improvements. (I know of one case where a pattern was remade and the parting of it differently saved the making of ten cores).

It is not speaking too strongly to say that a foundry manager can sit at his office desk and learn from analysis what is going on even better than if he stood out in the foundry.

To sum it all up, where Foundry Costs are ascertained, "gesstimating" is changed into estimating.

LINING A CUPOLA.

Seeing that you devote considerable space to cupola notes, I thought you would like to hear the way I keep my cupola in repair. The last time the cupola was lined, which was over a year ago, the mason tried to get the boss to line it with a double row of bricks and another row faced against the casing that would give it about an eleven inch lining and 60 inches inside. He thought that way it would make it easier for me to keep it in repair, so the boss asked my opinion of it, and I said it would be too weak a lining for in a short while the inside row would be all broken by the charging and it would not be safe. The way it is lined now there is a face brick against the casing and a wall of bull heads or key bricks put in end ways which gives a good solid lining of 12 inches, but what the mason had said set me thinking, and as it began to burn at the melting zone and below the tuyers, I began to chip away enough to allow me to set bricks in. I call it facing the cupola and so I kept on doing as it got burned out higher up. My object was to see how far I could face it with safety and still give a good solid lining and a good clear drop and perfect satisfaction all through the heat.

At the present I have it faced five feet above the tuyers or seven rows of bricks. The upper four rows last for six weeks running daily melting from 10 to 30 tons. The three rows just over the tuyers have to be replaced after running two weeks and the bricks below the tuyers will last for three months, or in other words I am running the cupola at a saving to the company of 1,000 bricks every three months over what were used in the meantime to keep it built up at the melting zone, but where the saving comes is when we reline it. We will start at the top of the facing or five feet above the tuyers. What is behind the facing is a good lining of 9 inches and is good for years. In this case it is a saving of 3,000 bricks or enough to keep it faced for nearly six months, and they used to reline it that far up every three months.

I think this is what the foundrymen are looking for—something to lower the expense of the cupola and at the same time give perfect satisfaction right along. This one melts 10 tons an hour and has kept up that rate right along since last lined over a year ago, that is, whenever the heat runs to 15 tons or over, and we have run as high as 50 tons and got it down in five hours from the time the wind went on. If you think this is of any interest and wish for further particulars, I would be pleased to give them. We also have a small cupola that was made especially for testing pig iron. It is only 12 inches inside lining and stands five feet over all from the floor. We ran 100 lb. of iron out in 20 minutes from the time the wind was put on, and we took four different tests out in succession by charging after each was run out.

JOHN RICKETTS.

The C. H. Wheeler Condenser & Pump Co., Philadelphia, Pa., has succeeded the Barr Pump Co., of that city. Clifton H. Wheeler, the former president and general manager of the Wheeler Condenser & Engineering Co., of New York, is now identified solely with the C. H. Wheeler Condenser & Pump Co., of Philadelphia.

The name of the Diamond Drill & Machine Co., Birdsboro, Pa., has been changed to Birdsboro Steel Foundry & Machine Co. Since the erection of the company's steel casting plant it was decided to change the name.

The Bloomsburg Car Mfg. Co., of Bloomsburg, Pa., has been absorbed by the American Car & Foundry Co., and will henceforth be known as the Bloomsburg department of that company.

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When sending in articles be sure to place your name and address on the article and on the drawings.

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TRADE OUTLOOK.

For a number of months there has been a race between the blast furnaces and the consumers in which the consumers have been ahead and stocks of pig iron have been constantly decreasing. The strenuous efforts on the part of the blast furnace operators, however, have at last won out, and in the past month stocks have increased. This condition and the added fact that the foundry tonnage is not increasing rapidly have tended to reduce prices for raw materials, and No. 2 Southern foundry iron may now be had at $13 at the furnace, while the same grade of Northern iron is sold at $15.50 at the furnace. This is about 50 cents a ton less than was quoted a month ago.

Few of the large melters have placed their orders for the second and third quarters yet, and all seem to feel sure that prices will not advance and may yet be lower. On the other hand, furnacemen do not look for any radical change. A number of furnaces have been blown out for relining, and this will have some effect on the amount of stock on hand at the end of the next month. Coke is now selling at $2.50 for foundry coke at the ovens in the Connellsville region. Some of the jobbing foundries thoughout the country report an increase of business, but the gray iron foundry business in general does not seem to have picked up much. The steel foundries for the most part are working at full capacity. The steel mills are all running full, but mostly on old orders.

Ship building on the Great Lakes is going on at a rapid rate and at present the American Ship Building Co. has eleven boats to build next year. This is a greater number than it has ever before had contracts for so far ahead. The railroads are continuing to place orders for new equipment and building is active throughout the country, calling for a large and increasing tonnage of structural steel. Prices of finished iron and steel are generally steady, but with some tendency to shade on the lighter finished forms.

AMERICAN FOUNDRYMEN'S ASSOCIATION CONVENTION IN NEW YORK.

Judging from the large number of letters which we have received concerning the annual convention of the American Foundrymen's Association Convention to be held in New York, June 6, 7 and 8, we feel that there is some misunderstanding among foundrymen concerning those who are welcome at this convention.

The American Foundrymen's Association was organized for the betterment of of the foundry trade, and its object has always been educational. All who are interested in the foundry trade are welcome at the meetings, including owners, foremen, or any one connected with the trade in any way who desire to co-operate for its betterment. It now looks as though there would be a very good attendance, but there is one point which Dr. Moldenke has asked us to call to the minds of all who intend to come, and that is, to remember that the special reduced rates are on the certificate plan and that when purchasing your ticket it will be necessary to secure a certificate from the ticket agent. When this certificate is countersigned in New York, it will entitle the holder to the purchase of a return ticket for one-third fare, thus making the round trip for 1⅓ fare.

The Murray Hill Hotel, Forty-first street and Fourth avenue, is to be the headquarters during the meeting and everything looks favorable for an exceedingly pleasant meeting. The number of papers to be read contain some which are exceedingly interesting. The following are the titles of the papers now in the printers' hands and it is expected that a number of others will be ready before the time of the meeting.

Dr. Moldenke wishes us to request all who are coming to come prepared to discuss any of the papers mentioned, or if they have any other points which they wish discussed, to send in the same or come prepared to bring them up.

The session on Wednesday, at Columbia University, will be an especially interesting session and several of the papers will be illustrated by stereopticon views. The excursion on Thursday to visit the foundry of the International Steam Pump Co. will also be full of interest, as this is one of the largest and best of the foundries which have been constructed recently. Every progressive foundryman in the country should be present, or at least be represented by his foreman.

One very interesting fact is that the patternmakers are taking considerable interest in their section and that there will be several papers on patternmaking subjects.

The following is a list of the papers now in the printers' hands in addition to which there are several others now in preparation.

A Simple Method of Molding a Propeller Wheel, by A. M. Loudon, Elmira, N. Y.

Notes on Some Retort Coke Melting Ratios, by C. M. Schwerin, Milwaukee, Wis.

Blowers, Piping and Cupolas at the Plant of the Michigan Stove Co., by W. J. Keep, Detroit, Mich.

Making a Molder, by H. M. Lane, Cleveland, O.

Care and Storage of Patterns, by H. M. Lane, Cleveland, O.

Melting Steel with Cast Iron, by R. P. Cunningham, Holyoke, Mass.

Things Needed in the Foundry, by David Spence, Chicago, Ill.

Needed in the Business, by Benj. J. Fuller, Allegheny, Pa.

A Successful Foundry Combination, by Arch M. Loudon, Elmira, N. Y.

Some Thoughts on Modern American Foundry Practice, by John C. Burns, Plainfield, N. J.

Practical Brass Founding, by C. Vickers, Milwaukee, Wis.

Accounting—An Influence towards Lessened Costs and Increased Efficiency, by Kenneth Falconer, Montreal, P. Q.

Cost Keeping for the Foundry, by R. W. McDowell, Uniontown, Pa.

Notes on Pipe Foundries and Suggestions on Metal Mixers for Foundry Purposes, by J. B. Nau, New York, N. Y.

The Effect of Manganese in Low Silicon Cast Iron, by H. C. Loudenbeck, Wilmerding, Pa.

A Modern Method of Venting Cores, by Jas. A. Murphy, Franklin, Pa.

The Use of Plaster of Paris in the Foundry, by Edward B. Gilmour, Peoria, Ill.

The use of Thermit in a Railroad Shop, by Jas. F. Webb, Elkhart, Ind.

Foundry and Pattern Shop Standards, by Wm. H. Parry, Brooklyn, N. Y.

Report of Committee on Standard Methods of Determining the Constituents of Cast Iron.

The Prose and Poetry of Progress, by S. H. Stupakoff, Pittsburg, Pa.

Better Conditions in the Pattern Shop—An Experiment that Succeeded, by J. L. Gard, Denver, Col.

SKELETON PATTERNS.

BY H. J. M'CASLIN.

As the building of complete pattern for large irregular castings such as nozzles, saddles, etc., is not always practical, the form of pattern commonly known as skeleton or frame pattern is resorted to. This practically consists in the construction of a skeleton or frame, the interior and exterior form and the thickness of which correspond to the required casting. The pattern work can be made more or less elaborate, according to the manner in which the molder desires to proceed in order to construct the mold, and upon the ability of this individual the evenness of the casting to a great extent depends, as the skeleton gives an outline only and a partial guide for the strikes.

Three views of one section of a cast steel nozzle weighing about 19,000 pounds are shown in Fig. 1, two of these castings being bolted together at A and subsequently riveted to the shell. While there may be several ways in which a skeleton pattern for a casting of this description may be constructed, the one under discussion has proved very satisfactory.

The completed skeleton is shown in the reverse position to that in which it is built and cast in Fig. 2. The contraction of steel castings of this description and size being uncertain, and in most cases will not contract, the usual allowance of 3-16 per foot, an allowance

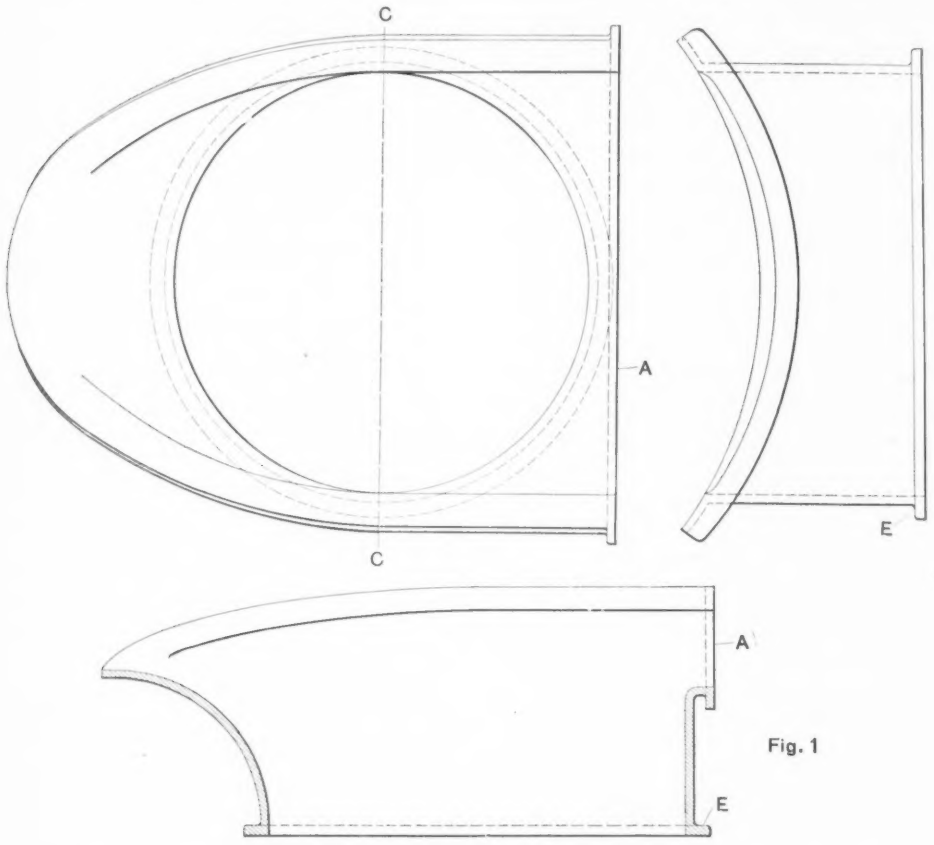


Fig. 1

of ⅛ of an inch per foot, with an extra allowance for finish for exact dimensions will generally be found sufficient.

CONSTRUCTION OF THE SKELETON.

Following the general practice of laying out the required full size sections, the building of the concave flange B is the first part of the work to be undertaken. To facilitate this operation, a form can be lagged up as shown in Fig. 3, conforming to the concave surface of the flange and upon which the flange is laid

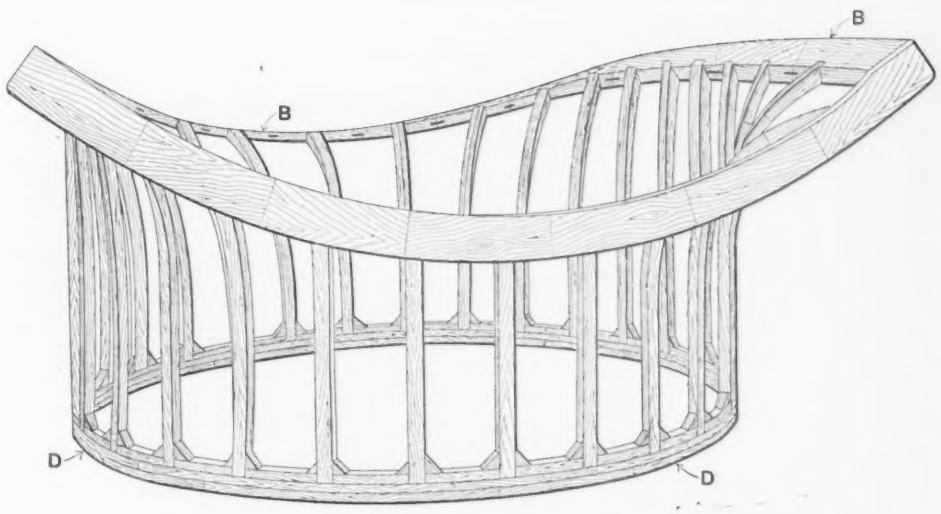


Fig. 2

out and built ¼ at a time. The segments for the flange are fitted, dressed to thickness separately and then tongued together as shown. A number of forms as shown in Fig. 4 are next gotten out and lined and leveled up on the floor, taking care to see that they are securely braced. The four quarters of the flange B are located and fitted together over these forms and secured to one another.

To facilitate the handling and storing of the pattern, if desired a joint can be made on the lines C C, Fig. 1, and the two halves screwed

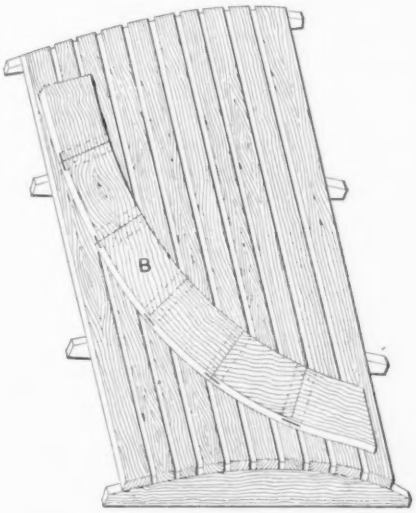


Fig. 3

together. The ring D, Fig. 2, forming a part of the skeleton and to which the ribs are secured is built up of segments turned to size and then elevated and secured with suitable supports and braces in its proper relation to flange B. It is next necessary to space off and locate the ribs. To facilitate the cutting out of the ribs, material about ⅞ of an inch thick can be used, each piece being fitted in place and gotten out as a templet and later when the templets have been dressed to form they are reinforced on both sides for strength and replaced in position as ribs. This method results in a saving, both of material and time. As the only sections shown by the draftsman are those illustrated in Fig. 1, it becomes necessary without developing the section at each rib, to work from one section to another. The templets for one-half of each end are gotten

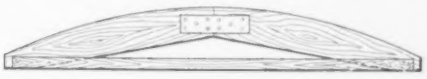


Fig. 4

out with the outer edges, sawed roughly to form. They are then placed in position and temporarily secured, with the aid of a flexible strip and the eye. The outer edge of each templet is dressed to form, working from one section to the other. The templets for the opposite half of the end are now marked from those already made and tried in place. The templets are then reinforced for the proper thickness, after which the metal thickness or interior form of the skeleton is laid off on each rib and they are dressed to the proper thickness. They are then returned to place and secured in position. It will be observed that no provision is made on the skeleton for

FIG. 6.

the flange E, Fig. 1, this flange being made up during the molding operation by using segments.

MAKING THE MOLD.

A hole is first dug in the floor to the required depth and two of the forms shown in Fig. 4 which were used for supporting the skeleton while it was being built are used for striking up a bed upon which the skeleton may rest. The forms are then removed and the skeleton set in position upon the bed. The core is then rammed up. To facilitate this operation and to prevent the sand from ramming out through the openings, boards can be set up to the openings and braced from the walls of the pit. The gates are arranged as shown in Fig. 6, and the runner prepared as the ramming progresses. After the core has been rammed up the boards surrounding it are removed and the core or body of sand dressed and slicked to the shape of the outside of the skeleton. The exact form and evenness of surface will depend to a large extent upon the molder's ability and judgment. The cope or cheek is then rammed up upon this outer surface. In order to do this, the parting is prepared, the flask placed in position and rammed up in the ordinary manner. The depression forming the upper flange E being made with the aid of a segment representing a section of the flange and at the same time a seat for the covering cores is swept off on each side of the segment.

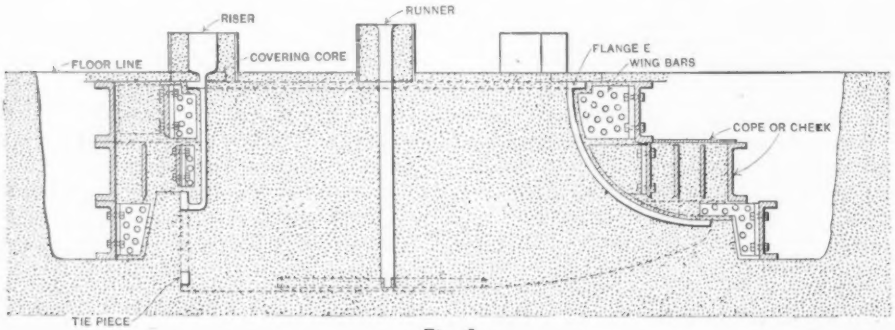


Fig. 6

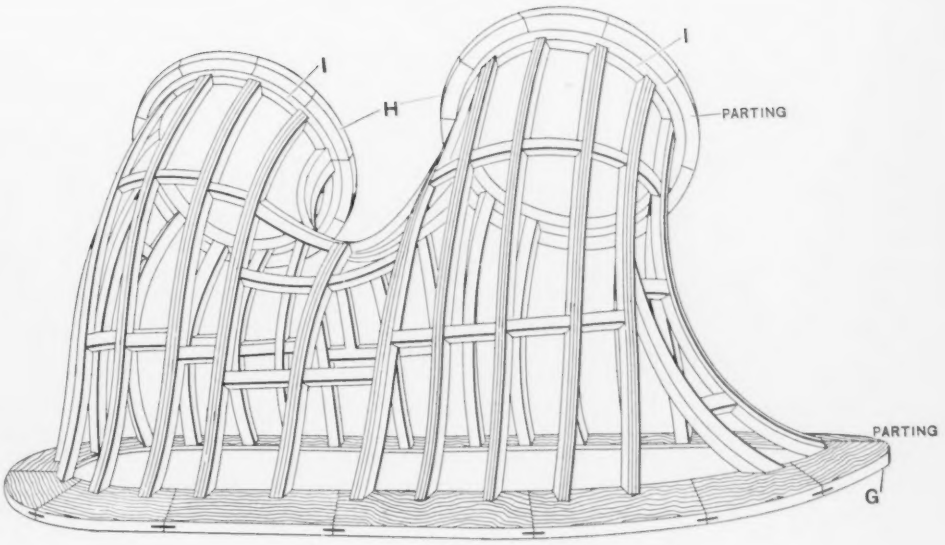


Fig. 10

The cope or cheek is now lifted off, blocked up and finished in the usual manner.

The sand between the ribs of the skeleton which represents the metal thickness of the casting is now removed from the core and the skeleton lifted off. The accompanying half tone, Fig. 5, shows a view of the mold at this stage. The core is now dressed to form, after which it is dried. The various parts of the mold are next assembled, the cope or cheek lowered into place, the covering cores to form the upper face of the flange E set, and risers prepared, and the space between the walls of the pit and the flask firmly rammed with sand. The mold is then weighted down ready for pouring. A cross section of the complete mold is shown in Fig. 6.

A DOUBLE NOZZLE PATTERN.

Three views of a steel casting for a double nozzle are shown in Figs. 7, 8 and 9. This differs considerably from the one already shown and brings out some different principles in molding A plan of the nozzle is shown in Fig. 7. A section on the line A-A, Fig. 7, is shown in Fig. 8, and a section on the line B-B in Figs. 7 and 8 in Fig. 9. The pattern is parted upon the line B-B. A view of the completed pattern in the position in which it is built is shown in Fig. 10.

In building the pattern the required sections are first laid out full size. The building of this skeleton is similar to the mold already described. The lower flange G is gotten out and built up over a form. The two upper flanges H-H are built up and turned with the lower half left loose, so that these two half flanges may be drawn separately. The rings I are secured by supports and braces in their proper relationship to the flange G, after which the ribbing of the skeleton is proceeded with. To assist in getting out the ribs forming the parting of the skeleton, a form may be lagged up corresponding to the parting, the outline of the rib laid out upon this convex surface and the rib built up in segments. After one rib has been built in this way, the one on the opposite side of the parting may be made to

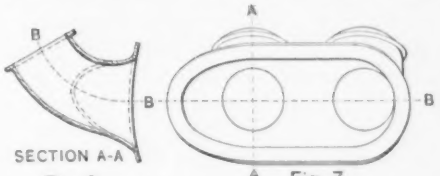


Fig. 8

Fig. 7

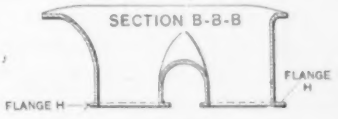


Fig. 9

fit it. The location and building of the other ribs is similar to that already described.

MAKING THE MOLD.

The molding of this skeleton differs from the one previously described in as much as it is cast upon its side, and with the aid of a core

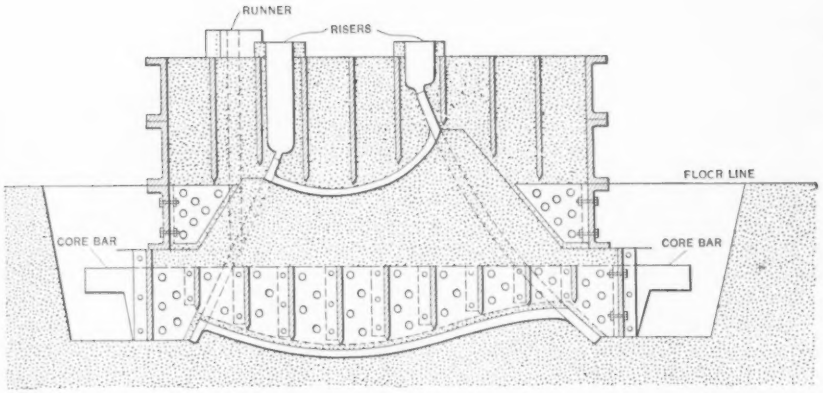


Fig. 11

bar the core or inside is lifted out. This necessitates the preparation of a seat for locating and supporting the core when it is returned to the mold. A hole is first dug to the required depth and the drag half of the pattern is bedded in to the thickness of the ribs. The inside is then slicked and dressed to form and the seat for the core prepared as shown in the cross section of the mold, Fig. 11. The core bar is next placed in position and the drag half of the core rammed up. The parting outside of the skeleton is prepared and the cope half of the skeleton placed in position, after which the ramming of the interior is proceeded with. Owing to the angle on which the flanges are set, the faces of the flanges from the parting line down are formed by the core as shown in the cross section of the mold in Fig. 11. In other words, as far as this portion of the flange is concerned, the core forms an intermediate part for the mold. When the core is left out, the lower portion of the flanges are exposed and left free to be drawn. When the ramming of the upper half of the core for the interior of the skeleton is completed, this portion of the skeleton is lifted off and the core slicked and dressed and paper applied, after which the skeleton is returned and the openings between the skeleton filled with sand and slicked off so that it will form a body upon which the cope is rammed in the usual manner. When the cope is completed, it is lifted off, together with the cope half of the skeleton. The cope is then blocked up, the sand between the ribs removed and the half of the skeleton pattern drawn. With the aid of the core bar, the core is then lifted out, blocked out, and the sand between the ribs of the lower or drag half of the skeleton removed and the skeleton lifted out. The drag portion of the mold is then finished, the runner and risers are prepared during the ramming up of the mold. The mold and the core are then dried, assembled, and prepared for pouring in the usual manner.

LABOR SAVING IN STOVE MANUFACTURE.

BY JOHN MAGEE, BOSTON.

It is remarkable how few appliances the stove industry has that are primarily labor-saving and that are new enough to be of interest. A little thought naturally separates our subject into two divisions: (1) Labor-saving machinery and tools, and (2) Labor-saving shop methods. We are largely limited in the stove business by the fact that it is nearly impossible to devise automatic machinery which will prove profitable, due to the fact that there are few articles of manufacture which require so many distinct and different operations as does the ordinary cooking range. The performance of any one operation averages a limited number of times in any one day; and no automatic machine can be made to pay unless it can be kept reasonably busy, so that the interest, depreciation and other charges of the costly machinery will not eat up the profit. In some few cases it has been possible to construct machines that will perform several operations on one piece, or the same kind of operation on several pieces of varying character, as in the automatic polishing machine. But such examples are rare and most of the profit-makers in the labor end of a stove factory are trivial in themselves; it is the total of many such that counts.

Beginning at the foundation of all our profit.

*From a paper read before the National Association of Stove Manufacturers at Chicago, May 10, 1905.

and incidentally much of our trouble—the foundry—we find the molding machine gives greatest promise, although not in any way entirely satisfactory as yet. To get best results it should be installed with automatic sand tempering and riddling machinery, conveyors to deliver and remove the sand, and with methods of doing all lifting and handling by power. Each of these individual problems has been fully worked out for classes of work other than stove plate, but as yet unconsolidated into a complete system to produce high grade castings. Some genius also has a large field before him in the production of a machine which will print-back faced work and obtain as good results as by hand.

From the molding machine we pass naturally to a consideration of the flask question, and it is astonishing how little thought this important detail seems to have received. Iron flasks are decided labor savers and in many cases can be used with economy of handling far surpassing that of a wooden flask. The carpenter shop also will feel the pressure of repairing less. Snap flask work is hardly known in some shops, particularly in the East, and very few firms understand the labor that might be saved by their molders, as well as flask makers and yard men. In larger sizes, with detachable bars, which are either left behind when the flask is removed or withdrawn from the mold just before, labor-saving results may be obtained, particularly when used in connection with match plates of large size. Whether it be wood or iron flasks that are used, the yard men can gain time if every mold board is marked with the size of flask and clamps required, flasks and clamps themselves being marked to correspond.

Every modern shop should have either a track or a trolley, and if possible should have both, the trolley being best for delivering melted iron to the floors if so desired and the track surpassing for other purposes. If a track is to be installed it should, of course, connect with both yard and charging platform.

For handling material on and off the cars, as well as for use in other places, general favor now seems to be given to the pneumatic hoist of motor block type in connection with proper traveling cranes, although electric hoists may also be used. This class of equipment is well known to all and hardly requires mention, yet, many of those foundries which, in addition to their stove work, make furnace and boiler castings, are wofully out of date in economy of handling bulky and weighty material. A rubber pipe connected to the compressed air system is taking the place of the time-honored bellows and in some places a pneumatic vibrator attached to the molding benches will save rapping the patterns and consequently decrease the labor of repairing breaks in the iron pattern shop. Water pipes to the molders' floor is a labor-saving device that costs little for the return it gives.

The core department of a stove foundry is generally of no great size, but is worthy of attention, as some of our factories are now including boiler work as a side issue. An automatic mixing machine has been found to give uniform results in this department and for fitting cores cast iron files cut quicker as well as cost less than steel ones. The ovens themselves are important. Design should be carefully considered and oil used for heating on account of the slight attendance required, particularly when thermostatic controlling is used.

The mounting shop has little new to offer that is of particular note; but there is a growing tendency to install what little machinery there is that can be used to advantage, and it is common now to see some kind of a conveying system for handling ranges from mounter to fitter and so on until finally landed in the storehouse. Work of this department is being facilitated by a profusion of emery wheels, drilling lathes, etc.; in fact, in some shops each man is given a complete equipment instead of using some machines in common with his neighbors.

Drilling being one of the larger mounting expenses, several plans have been tried to save labor in that direction, the use of tins to cast holes being well known. Some progressive firms are drilling with the aid of a complicated set of jigs and templates for which much is claimed.

Water fronts are almost the only pieces of stove casting upon which automatic machine labor can be satisfactorily expended, and it is now possible to procure a multiple drill which will work on eight water fronts at one time.

A few years ago the automatic polishing machine came into prominence and since then it has made considerable saving for those who use it, although producing work of doubtful quality, except in cases where the castings are especially designed to facilitate the operation. In this department polishing belts are superseding the old type of wheel for certain work

and when wheels are used those composed of compressed cotton buffs cut rapidly and give wonderful results when used with some of the newer abrasives. On some classes of polished work hand labor on small castings has been almost entirely eliminated by the water polishing barrel.

In the nickel room a saving of labor may be made by placing the work on wire trays or baskets to be washed or otherwise treated. The basket hangs by an air hoist from a trolley and is lowered into the successive tanks.

In the cleaning room air hammers and pneumatic drills fitted to operate emery wheels and cleaning brushes are used in removing fins, gates and burnt sand from furnace and other castings of large size,

There is very little machinery of construction novel enough to warrant mention in our pattern shops, but a type of lathe with reversible head to admit the swinging of large work away from the lathe bed is of value; and the benches should be equipped with steam heated glue pot and with gas lamps for melting wax—trivial features and not new, yet generally lacking. In the iron pattern shop a large blow torch driven by gas and compressed air is essential for straightening warped patterns, brazing, etc., and in this department one up-to-date concern has attached a file to the reciprocating part of a pneumatic hammer and is using it for filing.

Our shipping department sees great possibilities in the automobile as a labor-saving device in the place of unsatisfactory horse equipment, as the work of handling goods on and off trucks can be done by the same force that moves the machine, but as yet the large first cost has deterred almost everyone from adopting it until well out of the experimental stage.

Taking the second division of our topic, we find the greatest field for saving of labor to be in our shop methods, and foremost in the field is the use of an office system by which all accounts can be handled by a card catalogue reaching every corner of the works for all possible desirable information. The time clock is important as the clock cards themselves can constitute the pay roll when properly filled out. A billing machine should be used to make out shipping orders and can be adapted to make as many copies, either wholly or in part, as may be required. If so desired it will also make charge slips, car labels, railroad receipts, customer's bill, addressed envelope and such records as may be required for the office books, with one operation.

Our system must also contain provision for a record of every tool in the factory and in whose possession. This, in connection with suitable charges to workmen for tools lost, will soon save its cost in labor alone, as each man can be counted on to have his tools in their proper places where they can be found when wanted. Every pattern should also be catalogued, with size of flask, place that flask can be found and all other desirable information. All raw material in the stock room should be followed up by means of cards containing full information in regard to each article carried, so that it can be instantly located, and no goods should leave the room without an order suitably signed by both workman and his foreman. Much could be written in detail of the card system alone, as applied to a stove foundry, but only the salient points can be touched upon here on account of lack of time.

Proper design of goods before leaving the drafting board will often save time for all of the direct manufacturing departments and although thought is spent on ornamental design, etc., practicability of manufacture is sometimes overlooked. The draftsman can economize for the pattern makers and prevent mistakes by making a working drawing of each piece separately, although this is not generally done. Detachable nickel and similar devices, when properly designed on the drafting board, can save labor in the polishing, nickeling, mounting and packing departments.

Racks for castings should be carefully considered and should be placed in the center of the building, or where the light is poorest, instead of around the walls near the windows, and in similar places of value for the most economical application of labor.

Light is essential if labor is to be applied to best advantage and may be secured by as many windows as possible, rising from floor to ceiling with upper sashes of prism glass which must be kept clean. Proper ventilation and heating should be thought of, as labor always works to poor advantage in a vitiated atmosphere or improper temperature.

The location of all raw material should also be studied with a view to storing it near its place of use.

Systematic inspection of the plant once each month will discover defects in the building,

machinery, etc., which can then be repaired with less labor than at a later date. In this connection it should be remembered that "stitch in time saves nine" and proper care of buildings at the proper time will soon pay for the labor incident to the maintenance of a separate department of repairs. Certainly not the least important of shop methods is the necessity of co-operation among all heads of departments. As much waste of labor can be caused by two departments pulling in different directions, harmony should be secured at any cost. We all know, too, how important is the arrangement of departments with reference to one another for economy in handling goods, and how, in making changes, consisting of new buildings, etc., immediate wants are often short-sightedly consulted rather than the requirements of the future.

Lastly it should always be borne in mind that in these days of sharp competition the greatest saver of all, in labor, as in all other details of trade, is system.

MAKE YOUR PLANT A SUCCESS.

BY DR. EDWARD KIRK.

But few managers of manufacturing plants seem to have the proper ideas or take the proper course in the management of such plants. They fail to realize that they have it fully in their power to elevate the moral standard of their workmen, and by so doing completely overcome many of the annoyances and losses they are continually subjected to.

Such as men failing to report for work, drunkenness among their employes, poor mechanics, strikes, etc., and by so doing assure the success of their plants.

They do not take advantage of the resources at their command to overcome these objectionable features in manufacturing plants, but take things as they find them. Wage a continual warfare for the existence of the plant, and after years of struggling find themselves but little better off than when they began, which is due in many cases to the drinking habit of their workmen, strikes, etc., and the continuous warfare waged between employer and employe, and the lack of interest in the success of the plant by the latter.

This should not and would not be the case if the management of every manufacturing plant made it their aim to improve the morals of their workmen, by giving employment only to sober, industrious workmen, whose aim it was to own their own homes and raise their families in a respectable manner.

Such men have an interest in the success of the plant, for if it fails their employment is gone and the value of their property is depreciated by the loss of its business to the town, and they would do everything in their power to prevent strikes and losses to the plant.

A few such men among a shop full of men who have no interest in the success of the plant or town and are ready at any moment to pack their trunk or move their families, are helpless to effect these results, but let the shop be filled with them and the success of the plant is assured, so far as the workmen are concerned.

It should be the aim of every manufacturing plant to elevate the moral standard of their workmen, be they mechanics or laborers. This may be done by paying fair wages for amount of work done, and treating all workmen fairly. By doing so the plant is given a good name among workmen. Desirable workmen are attracted to it when seeking employment, and a better class of workmen may be obtained.

Men who frequent saloons after working hours, or drink to excess after pay day, should be quietly called into the private office and informed that if they do not stop this their services will be no longer required. If this does not reform them discharge them at once. If they stop these habits for a short time and then fall back into them again give them another talking to and another chance. If this does not prove effective discharge them at once, and let it be understood that when you talk to a man in this way, you mean what you say. But do not make the mistake of trying to reform him and others at the same time, by giving him a temperance lecture before his fellow workmen, for this humiliates him, rouses the spirit of get-even, and only makes him and others worse. Do not try to enforce prohibition, for the workman who only takes an occasional drink, is not objectionable. It is the man who frequents saloons, and induces others to drink, that demoralizes the working force of plants, by creating or spreading the drinking habit among them. Such men should be ferreted out and promptly reformed or discharged, for such men may in a short time induce the greater part of his fellow workmen to frequent saloons during or after working hours.

Do not have rules in reference to the drinking habit printed and hung up in or about the shop, for such habits should not be permitted among workmen of a shop and require no rules.

Men who are constantly talking to other workmen and finding fault with working hours, tools, wages, foreman, management of the shop, etc., are mischief makers among workmen, and should be promptly discharged and quietly informed what they were discharged for. If this is done they will not be discharged from many plants before they learn to mind their own business and may become desirable workmen.

The selection of apprentice boys is the most important point of all to be looked after, for from the apprentice boys come the mechanics of the future. If the apprentice boy belongs to a drinking family in which the filling of the beer kettle during the day or after working hours is considered one of the necessities of life, he, of course, contracts the drinking habit from his infancy, and cannot be made to see any harm in it, and when he becomes a mechanic with money of his own frequents saloons and induces other young men of the shop to do the same, and when he marries, brings up the family in the same way. His sons may learn the father's trade with the same habits and in this way the drinking habit is perpetuated among mechanics.

If the boy is one of the bad boys or toughs of the town he may settle down during his apprenticeship and reform, but the chances are that he will find kindred spirits among the men of the shop for the management that would accept such a boy as an apprentice must have a poor opinion of the mechanics in the trade he is to learn, and may have a shop full of such men, and the chances are that he will retain his boyhood characteristics until late in life or even through life. In which case he is neither a desirable apprentice or mechanic, for he is sure to impart these characteristics to other workmen and make trouble for both employer and workmen.

Besides these objections the employment of such boys as apprentices has a demoralizing effect upon the boys of the town, who are led to believe that no matter how bad or tough they are, when they get old enough they can become an apprentice at the manufacturing plant, learn a trade and earn good wages when men. And in some cases the inducement to become an apprentice is a desire of a boy to join the gang of toughs that are employed at the manufacturing plant.

When a boy applies for an apprenticeship his family and history as a boy should be looked up. He should be required to belong to a good family, the father of which is a temperate, industrious man, and a good citizen. The boy should be required to be a graduate of a high school and to be known in the town as a good boy. If these requisites are found to be satisfactory he should be put to work for a few weeks or months doing general work about the shop and if found satisfactory at this work made an apprentice.

The managers of many manufacturing plants will no doubt say that these rules are all right, but that they cannot be carried out in their town for the good boys and the graduates of high schools are all brought up to be clerks, bookkeepers, etc., and to think it a disgrace to be a mechanic and only the rougher element of boys apply for the apprenticeship, or want to be mechanics.

There is no doubt some truth in this assertion, but whose fault is it that they have been brought up in this way? No one's but the management of these plants, for by employing workmen that frequent saloons every night and after every pay day are seen drunk and boisterous on the streets, perhaps for days, have permitted the impression to be made on every sober and industrious father and mother in the town that to make their son an apprentice at the manufacturing plant was to consign him to a drunkard's grave. How different this would be if only sober, industrious men were employed in manufacturing plants, whose aim it was to work steady, own their own homes and place themselves and families among the leading families of the town. The sons of the workmen would then, not only be desirable apprentices, which in many cases they are not at the present time, but the sons of the best families of the town would be taught that it is more profitable to become a mechanic than a clerk or bookkeeper, and the management of the manufacturing plant would have at their command the pick of the boys of the town for their apprentices, and could select only the brighter and more likely boys to become expert mechanics. Let these rules be adopted by every manufacturing plant in the country and the drinking mechanics will rapidly disappear, and in 20 years from now, when the apprentices taken under this rule have become the mechanics, there will not be a drinking one among them.

This system of managing working men and apprentices is no idle theory, for it has been tried in numerous plants and found to work well, for some 10 years ago when visiting some

foundry plants, foundrymen frequently complained to me that they could not get sober, industrious molders, and seldom run a full heat owing to their molders having been drinking at night and unfit for work the next day, and after pay day they were generally compelled to close down for one or two days. I outlined the foregoing system to them and it was at once adopted by a number of them. I had occasion to visit one of these foundries a few weeks ago in which were collected at that time as drunken a lot of molders as were probably ever collected in a foundry. The majority of them only worked when out of money and credit to get drink. The foundry was idle about half the time, a full heat was seldom run, the firm was on the verge of bankruptcy and ready to try anything that promised an improvement to their condition and at once adopted this system. They first discharged every molder and closed up the foundry. They then advertised at distant points for molders, when a sufficient number was secured, the foundry was put in operation with an entire new force of molders. Each one of which was quietly given to understand that the frequenting of saloons and drinking habit would not be tolerated.

The old molders who had families and remained in the town after being discharged were taken back after they had been idle a sufficient length of time to see the folly of what they had been doing. From that time on the foundry was a success and today is the leading industry of the town. The manager informed me that they had not had a strike or any trouble with their men since the system was adopted, although they had a union and the shop was run under strictly union rules, which he had not found to be objectionable, and, in fact, preferred to settle any dispute that arose with the shop committee to settling it with individual workmen.

They did not have a drinking molder in the foundry, many of whom were the leading men of the town and not only owned their own homes but other property besides.

Now, if this system was a success in that plant, as it certainly proved to be, it can be made a success in any plant; for ten years ago they certainly had the worst lot of molders I ever saw in a foundry. To make this system a success a limited amount of detective work should be done outside the plant and this should always be done by a man not employed in or about the plant, and only when a man fails to report for work or is found incompetent to do his work, from drinking, or is surely known to be leading others in the shop to drink and injuring the reputation of the plant, by frequenting saloons, should he be talked to or discharged for the drinking habit.

PRODUCING SOUND CASTINGS.

Under the above heading, I have read the very interesting article in the March issue of *The Foundry*, and consider what is said about the careful selection of the molding sands and the manner in which different molds should be dried, good practice, but in the third paragraph the writer states as follows: "Pouring the castings with dull iron is apt to give sounder castings than with very hot metal, as the latter keeps in disengaged gases which may be held under the skin."

My experience teaches me that to produce a sound casting it must be poured hot, and the hotter the better. I hardly see any benefit in holding the gases spoken of under the skin of the casting, unless one was making brakeshoes or sash weights, as in producing machinery castings the gas bubble, as I suppose we may term it, if there is such a thing in good iron, would be very likely brought to light, and the only way to satisfy consumers of castings is to strive to eliminate these defects instead of covering them up.

Dull iron will produce a dirty casting in a clean mold, while hot iron will always make a clean casting in a clean mold.

With reference to the fourth paragraph of this article, where the writer states, pouring from the bottom with whirl gates gives cleaner iron than top pouring, a fact readily seen in roll making. For the benefit of those not familiar with foundry practice, I wish to state that pouring from the bottom is not always productive of good results, while in the case of a roll it is undoubtedly the best method; but let us consider the questions of the cylinder bushings, laundry rolls and other cylindrical castings.

It has been proven that the best results have been obtained by gating these molds on the top in preference to the bottom. With reference to the cutting action of the stream being severe when pouring from the bottom, will say that the wear on the mold is greater when gated at the bottom than when gated at the top.

The fifth paragraph informs us that when we must have at least 2 percent of silicon and as little manganese as possible in our metal. I

will agree to the 2 percent silicon but see no objection to the manganese, in fact, to produce iron with good wearing qualities I would prefer a pig iron ranging 1 to 2 percent manganese in a mixture with at least 60 percent machinery scrap regardless of silicon. While this mixture would not produce the softest castings, it would produce castings that could be machined easily and would wear well. In using a high manganese iron it is possible to carry more steel in the mixture without being troubled with shrinkage cracks.

The writers object in criticising this article is simply to create more discussion on the subject which may be instructive to other readers as well as himself.

The gist of the article in question is contrary to facts that have been demonstrated in my daily experience in the foundry and if I am on the wrong track I want to know it.

P. R. RAMP.

MOLDING MACHINE PRACTICE.

BY F. W. HALL.

This month I will show a machine casting mounted on two different types of molding machines, viz., a hand draft split pattern machine and a drop pattern machine. The casting under consideration is not a difficult piece to make or to fit up for one skilled in the art, but there are a number of points on it which to many will probably be rather puzzling. It will be noticed that the parting line drops and rises below or above the general parting line of the pattern in places, and this of course adds complications to fitting up the machine.

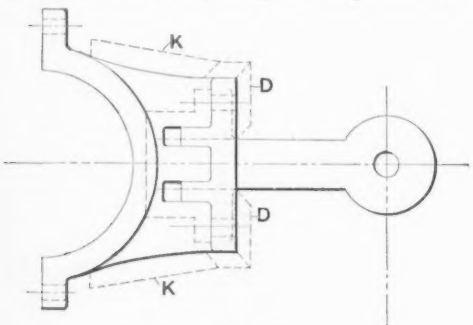
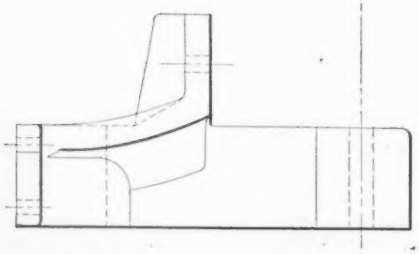


Fig.1



When a machinist undertakes to mount a pattern he sees at once how to do the machining of the stools, strippers, etc, but the making of a perfect match between the cope and drag in the case of an irregular parting will require some special work. On the other hand, a molder would find less difficulty in this point, but would be lost when he came to do the necessary machine work, hence some knowledge of both arts is necessary in fitting up a molding machine. Of course there are other methods by which this pattern could be mounted and give good results, but the two methods shown serve to illustrate the fitting up of each class of machine. Frequently, after a skilled man has fitted up the job he will see some better method by which it might have been done, and it is only by practice in this line that the greatest amount of skill can be attained.

The mere drawing of a pattern through the stripper out of the sand does not always signify that the mold is all right, for you may find it impossible to remove the sand from the machine, especially when there is a large green sand core formed in the interior of the pattern. The weight of this core will sometimes be so great that the sand will stay on the strippers when the flask is lifted off. In such cases as this it becomes necessary to use nails or a crab for supporting the green sand core and binding it to the other parts so that it will lift properly.

In the ordinary method of molding such a piece on the floor without a machine the large green sand core will be placed in the drag, where it would remain all right, but in all classes of molding machines except the roll over type, it is necessary to cope off both pieces, and one of them is then turned over for the drag.

In mounting this casting upon a split pattern machine, it would of course first be necessary to determine the parting line and then split the pattern on that line.

The pattern shown in Fig. 1 may be mounted on a machine, as shown in Figs. 2 and 3. The drag portion of the mold is shown in Fig. 2, the section being taken through the pattern.

It will be noticed that about the center of the pattern there is a projection which extends below the general parting line as shown at A-1 and also at the point T, there is a place

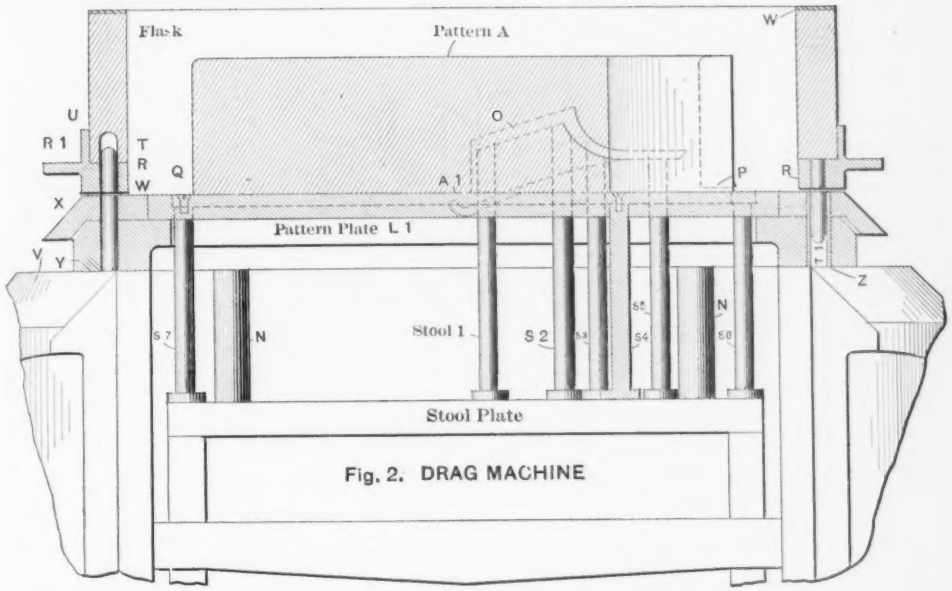


Fig. 2. DRAG MACHINE

where the parting line rises above the general surface of the plate Q.

A forming block must be made of the same size and shape as the cavity at A-1, which corresponds to the projection at C, Fig. 3. A stripper must also be made of the form shown at D, Fig. 3. This stripper fits up against the face of the pattern at C so as to bring the parting line to the proper point above the pattern plate L. The location of pattern D, Fig. 3, should be determined by laying out the center lines upon the plate L, placing the pattern in its proper relationship to these, and securing it to the plate by means of screws, the pattern being made of iron. The outline of the pattern V should be scribed on the plate L, the pattern removed and the strippers about the portion B carefully laid out, one of these being shown at K. The general outline of the strippers K and D are shown by dotted lines about the pattern in Fig. 1. The place for the strippers in the plate L must be cut down to a depth of ¼ inch. This can be done very advantageously upon a vertical milling machine. The stripper K is made out of sheet brass shaped to fit the cavity which it is to fill. On the upper surface of the stripper K the piece D is secured. First, however, it will be necessary to secure the stool S-8 in place. It will be noticed that the strippers are carried upon the stools S-8, S-9, S-10 and S-11. These stools are made from pieces of 1-inch cold rolled shafting turned down so that the bodies are ½ inch in diameter. They should all be of the same length. The deep pocket C, Fig. 3, can be cast in the plate, as can also the pocket A-1, Fig. 2. After the plate L is finished all over, the pattern A, Fig. 2, can be carefully located in the center of its plate. As this pattern extends a long way into the drag, it would be well to arrange stripping plates along all of the straight surfaces, as shown at Q.

The inside of the large end would also be provided with a stripper which would follow from the inside around both ends until it runs into the pocket A-1. Stripper D, Fig. 3 is the most difficult one to form, as its upper surface must also act as part of the pattern. This stripper is made about ⅝ of an inch wide, ¼ of an inch thick, and the end that comes in contact with the edge of the pattern must conform to the exact outline of the pattern. After the stripper D is in place the recess A-L in Fig. 2 is cut about ¼ inch deeper than the form D, Fig. 3, would require. The recess for the stripper Q is also cut by the milling machine. In fact, stools must be provided for these strippers to hold them rigidly when the work is resting upon them. The part P, Fig. 2, must also be built up and secured to the stripper plates, as shown in Fig. 2. The patterns are then removed from the plates and a hole at least ¼ inch in diameter drilled through the plate L-1 opposite the bottom of the hole A-1. Several small holes must also be drilled in the bottom of the hole A-1 and nails driven into them so that their heads

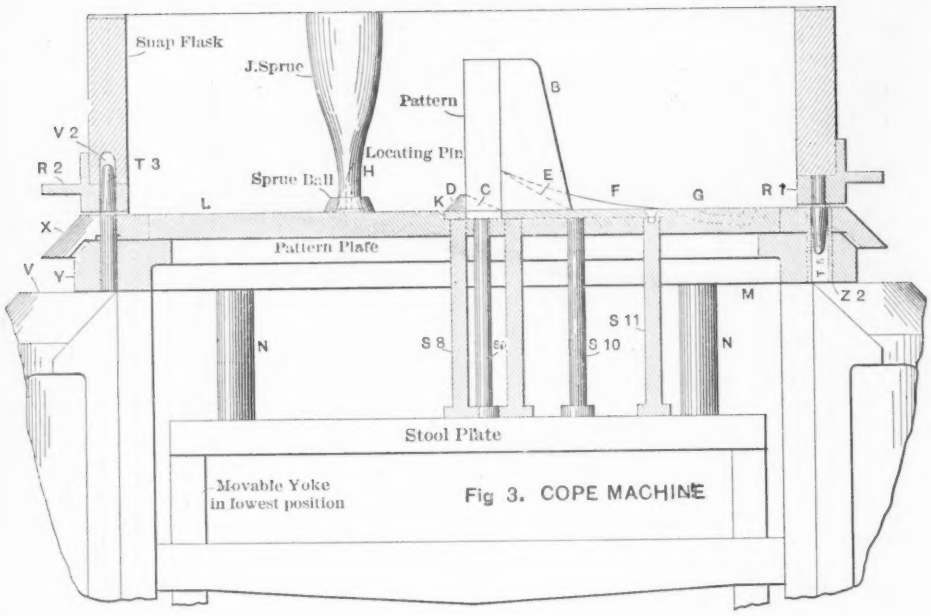


Fig 3. COPE MACHINE

project a little less than ⅛ of an inch. Care must be taken to see that when the two plates are placed together none of the nails touch the blocks C and D on the plate L, Fig. 3. The two plates are then placed together face to face, clamped in position and some Babbitt metal run in through a ¼ inch hole opposite A-1, in plate L-1 in Fig. 3. When cold, the plates are separated, when it will be found that the Babbitt forms a perfect match from the projections C and D in Fig. 3. In like manner the opening at G, Fig. 3, is babbitted to fit the projection P, Fig. 2.

Now, as both the cope and the drag patterns have been completed, it is necessary to make the gate and the sprue as shown in Fig. 3, which completes the mounting of the piece upon a split pattern machine.

To mount this piece upon a drop pattern machine, the drag section of the pattern must be split on the same parting line decided upon for the previous method. The general arrangement of mounting for this style of machine is shown in Fig. 4. The pattern is to drop down through the plate M-5. For this reason it is necessary to add extra material on the lower face of the pattern to build up the space between the plate L-2 and the upper surface of the plate M-5. For a short distance, usually about ¼ inch below the surface of the plate M-5, the pattern is made full size, but below this point it is reduced or cut back ⅛ of an inch all around, so as to reduce the amount of surface to be removed by filing. When the wood patternmaker is fitting up the drag pattern A-3, Fig. 4, he should cut the groove A-1 in the pattern for the stool strippers, provided it is decided to use these.

These strippers are used when it is desired to make absolutely certain of the strippings of this portion of the pattern. In many cases, however, these portions of the pattern are simply given ample draft and the sand lifted without the aid of strippers.

The patternmaker should also cut the pocket A-2 for babbitting purposes. The plate M-5 is made rather heavy with the rim 1¼ inches thick about the outside and beveled as shown. The center of the plate is ½ inch thick and at the stripping edge it is cut back ⅛ of an inch to within ¼ of an inch of the upper surface. The points corresponding to A-2 and P-1 in the plates for this method are babbitted as in the case already described.

It will also be necessary to make the plate L-2 for supporting the pattern A-3. This is called the pattern plate and is about one inch thick upon the outside edge and ½ inch thick in the center. Directly beneath the surface of the pattern a pad ⅛ of an inch high is cast for supporting the pattern. Of course, the necessary finish must be allowed on the wooden patterns to provide for finishing all surfaces, which require machining. If stools are to be

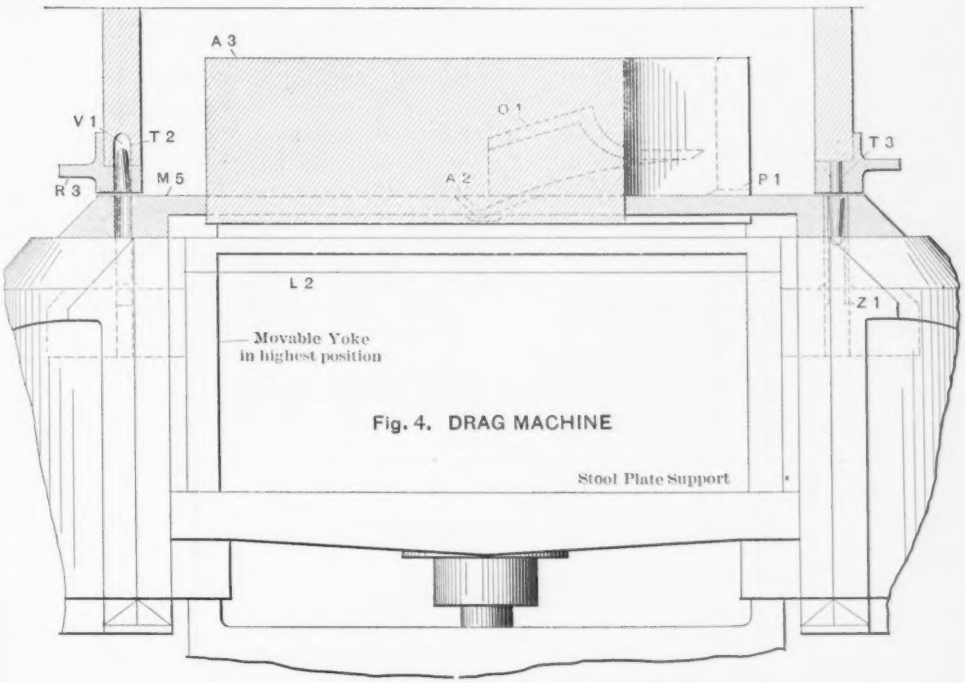


Fig. 4. DRAG MACHINE

used for the part O-1, Fig. 4, it will be necessary to make a pattern and from it a casting for the required stool plate.

After the castings are received from the foundry, they are machined to the proper thickness and then center lines laid out on the plate M-5. From these lines the pattern A-3 is located. The flask pins and bushings are also located as shown in Fig. 4. It is also necessary to drill the screw holes for clamping the plate M-5 to the drop of the molding machine. The pattern A-3 is secured to the plate M-5, and after the base of the pattern A-3 has been machined to shape it is laid on the plate M-5 true with the center lines and its outline scribed. The edges of the opening in M-5 are then filed or milled to the proper form.

If stools are to be used for stooling at the portion A-1, they are made as described in connection with the other style of machine. The babbitting for points A-2 and P-1 is also done in the manner already described. The plate M-5 is secured to the machine and the plate L-2 secured in position and located by dowel pins. The pattern is slipped through the plate M-5 on to the plate L-2, its location marked out and it is then secured to the plate L-2 by screws, three being usually sufficient. Care should also be taken to see that the flask pin holes are in line with the holes in the lugs on the movable yoke of the machine. The pins and bushings P-2 and Z-1, Fig. 4, are fitted into place as shown in Fig. 3. The short pin D-3 is placed on one side as shown in Fig. 3. This method of placing flask pins allows them to be stripped as the pattern is. The advantage of this will readily be appreciated by any one who has had experience in molding machine operations. The cope plate and pattern are equipped in a manner similar to the drag pattern.

The flask for this job can be made either of wood or iron, and the same flask will work on either type of machine. The flask pin fittings are special fittings made for the molding machine, the general style being shown in the sectional views, Figs. 2 and 4. The projection R-1 serves as a lifting handle for the flask.

The difference between the split pattern and the drop pattern machines is that in the split pattern machines three special plates L-1, X and Y, Fig. 2, and four posts N for connecting the stool plate with the plate X are required. When using the split pattern machine it is lowered four inches or more according to the draft of the machine. When stripping the pattern from the sand, the crank at the side of the machine is pulled over toward the front, causing the stool plate to rise, carrying the plate X with it, which strips the pins and leaves the flask as shown in Fig. 5. The stools 1, 2, 3 and 5 rise up through the pattern A.

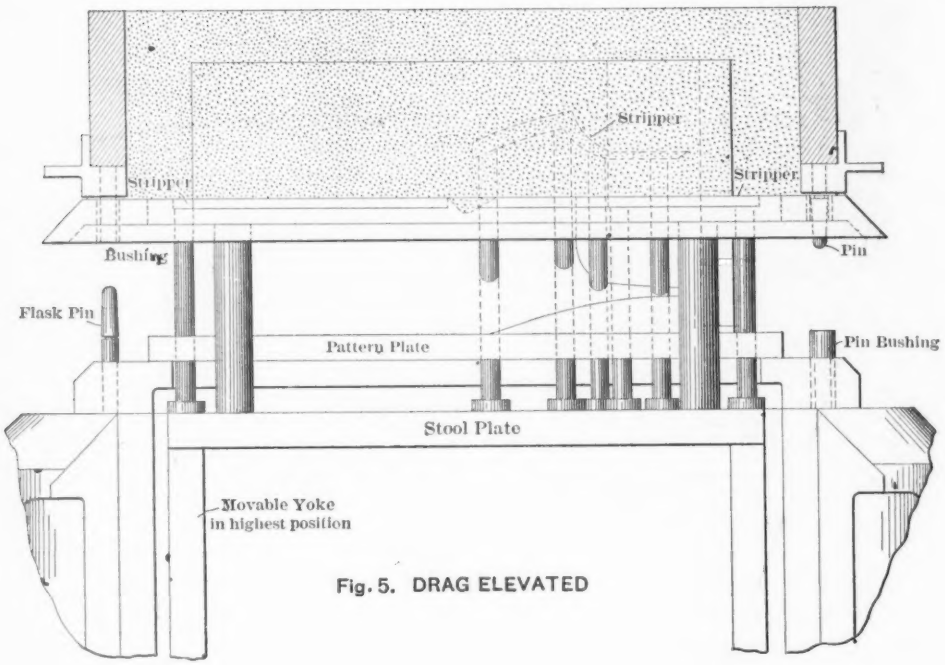


Fig. 5. DRAG ELEVATED

which sets down on the pattern plate. The cavity in the mold is indicated by the dotted lines.

To make a mold on these two styles of machines, the following procedure is necessary. First, on the split pattern machine, the drag, Fig. 2, is lowered, bringing the plate X to its proper position by means of the operating handle. The plates should all rest as shown in Fig. 2, especial care being taken to see that the flask is down on the top of the plate X. The flask is filled with sand, rammed and struck off in the usual manner. With the lever at the side of the machine the plate X is lifted up, as shown in Fig. 5. The drag is then lifted off and set on the floor. The cope is treated in the same manner, the sprue being formed either by cutting it with a tubular sprue cutter or by means of a regular sprue pattern, as shown in Fig. 3. In the case of the second type of machine shown in Fig. 4, the molding machine handle is thrown so as to bring the yoke into its highest position. The flask is then filled with sand, rammed, struck off, and the pattern A-3 drawn from the sand by stripping it down over the plate M-5 by means of the handle at the side of the molding machine. The stop nut on the machine is so adjusted that when the top of the pattern A-3 is flush with the part M-5, the parts will be brought to rest. After the drag has been formed it is lifted off and set on the floor, and the cope formed in the same manner.

It is evident that to mount this piece as shown in Fig. 4 requires a new plate M-5 for every job, while the machine shown in Fig. 2 requires a new pattern plate L-1. The form shown in Fig. 4 also requires a new pattern plate L-2 for every job, while the stool plate shown in Fig. 2 will generally fit several different jobs on the split pattern machine shown in Figs. 2 and 3. It is not necessary to drill the flask pin holes in all the plates for the machine, which reduces the work considerably. The mounting of the patterns in plates like those shown at L-1, with the use of small strippers on the ends of stools is usually cheaper than the expensive strippers M-5 required in connection with the form shown in Fig. 4. When a vertical milling machine is at hand, the cost of equipping the split pattern machines can be brought down to a very reasonable figure. It is true that not all patterns can be mounted to advantage on a split pattern machine and that the first cost of installation of a split pattern machine is very much greater than the other, but as a rule this will soon be made up by the saving in pattern expense so that in the long run the split pattern type will be found

cheaper for general work. The split pattern type of machine can also be used in connection with an air ramming device, which will greatly increase the output. The piece shown in Fig. 1, mounted with a 12 by 18 flask on a Paxson-Hall machine could be molded by an average man at the rate of from 200 to 250 molds in eight hours.

SHOT IRON.

Inquiry.—In the April number of *The Foundry*, on page 65, I read with great interest Mr. Wooden's remarks on "Shot Iron."

This innocent and apparently "Not-worth-while-to-bother-with" subject is of very substantial importance, and the vast sums that have been lost by neglecting it during past years is astonishing.

Mr. Wooden does not state what his use and treatment of the drop from the cupola was before the insertion of the Sly mill. It will be of great interest to me to know this, and I believe many other readers of *The Foundry* will also be interested. Please ask Mr. Wooden to advise us whether he "handpicked" any pieces of iron from the drop before it was thrown on the dump, and if so, about how much iron was recovered daily by such handpicking. In other words, we would like to know the amount of the net gain by use of the Sly mill. It is fair to say to all concerned that the writer is a great believer in the Sly mill, and has secured from friends some surprisingly good results by the use of these mills. The more data that can be brought to light on this subject the better for all concerned, and especially for the people who are responsible for foundry results.

W. S. MOREHOUSE.

Answer.

In the April issue of *The Foundry*, I perhaps did not make myself as plain as I should have done. In our old foundry, some two or three years ago, we used to rattle our cupola drop in one of our common stave casting mills getting some 600 to 800 lb.; heats about 20 tons per day. When we moved into our new place we were short on casting mills to clean our castings, so it was thought best (?) and cheapest to "hand pick" the drop; so it was hauled to the dump and one man put in about ¼ of a day picking it over and rolling it over the bank, this after it had been somewhat picked over at the cupola.

My heart sank within me as I walked about the dump occasionally "hand picking" it myself. This hand picking at the dump bringing in about 300 to 500 lb. per day—heats about 30 tons. Then came the installation of the Sly mill. The first six days of running the mill show the following weights of good clean shot iron: 1st day, 1,570 lb.; 2nd, 2,197; 3rd, 1,825; 4th, 1,638; 5th, 1,677; 6th, Saturday, (eight hours) 1,440. This shows about 1,000 to 1,200 net gain for the cinder mill at a cost of about $1.25 per day for operating the mill.

Am now picking nothing from the dump at the cupola but pigs and large clean scrap, hurrying the drop to the mill and getting clean shot iron about one ton per day. Heats are now running about 26 to 27 tons per day.

Would be glad to answer any question that I can or help any one in the advancement of the foundry business.

P. M. WOODEN.

CARNEGIE RESEARCH SCHOLARSHIP.

At the annual meeting of the Iron and Steel Institute held in London, May 11, 1905, a Carnegie Research Scholarship of $500 was awarded to Henry Cook Boynton, instructor in Metallurgy and Metallography in Harvard University. Mr. Boynton is the third American to be successful in obtaining this highly prized scholarship, two Columbia University men having received it in the past. Mr. Boynton was born in Plymouth 30 years ago and was educated in the schools of that city. In 1896 he entered Harvard University and received his A. B. degree in 1900, his S. M. degree in 1901 and his S. D. degree in 1904. His thesis for the doctor's degree dealt with the "Relation between the Treatment, Structure and Properties of Steel." Mr. Boynton has devoted considerable time to research work, mainly in the metallography of iron and steel, and has written several papers on the subject. The present scholarship will make it possible for him to carry on these investigations in the metallurgical laboratory of Harvard University.

The R. Watt Machine Works, Ridgetown, Canada, have been incorporated with a capital of $50,000. The company will conduct a foundry and machine, boiler and agricultural implement shop.

The Smith Stacker & Feeder Co., Hamilton, Ontario, has been incorporated with a capital of $40,000. The company will manufacture agricultural implements and carry on a general foundry business.

METALS IN FOUNDRY PRACTICE

Devoted to inquiries from Practical Foundrymen on subjects relating to the Melting and Using of Cast Iron, Steel, Brass and Bronze.

The following experts answer questions in this department:

W. J. Keep, Cast Iron.

J. B. Nau, Metallurgy of Steel and Steel Castings.

Dr. Richard Moldenke, Malleable Castings.

C. Vickers, Brass Castings.

We have also made arrangements with several others to act as special contributors upon Brass, Bronze and other subjects. All inquiries should be addressed to the Editor of THE FOUNDRY, and they will then be forwarded to those in charge of the different subjects.

CAST IRON NOTES.

BY W. J. KEEP.

Strength of a 1-inch Test Bar.

We have in our establishment one of our testing machines for breaking ½ in. square by 12 in. cast iron bars.

In one of our heats this week the average shrinkage was .154 in. per foot and the breaking strength equaled 485 lbs.

Am I right in assuming that a testbar from the same iron 1 in. square and 12 in. long is equal to 1,940 lbs.

Answer.—If a ½ in. square bar was relatively no stronger than 1 in. square bar you would have $480 \times 8 = 3{,}883$ lbs. but the slower cooling weakens the one inch bar and for this reason you cannot use any formula. If you will look at Vol. XXV p. 899 of Transactions of the American Society of Mechanical Engineers you will find my charts for making this computation. By chart Fig. 450 you will find that a shrinkage of .154 in. of a ½ in. test bar indicates 2.20 percent of silicon. Now turn to page 901 and table 1 gives a divisor for a ½ in. square bar with 22% silicon of .1683 as 2.20% is ⅕ less than the difference between 2.00 and 2.25% and $.1683 - .1648 = 35$. ⅕ of $35 = 7$, $.1683 - 7 = .1676$.

$485 \div .1676 = 2894$ the strength of a bar one inch square from the same iron as the ½ in. square bar 480 is a very high strength.

To Increase Capacity of Cupola.

Our cupola has a round shell 40 in. outside and lined to 34 inches diameter. There are eight tuyeres 2 inch high and eight inches wide. The distance from the top of the sand bed to the bottom of the tuyeres is 7 inches. We blow with a No. 8 Sturtevant blower having a 12 in. outlet reduced to a 10 in. pipe which is 85 feet long with three rather short bends. This 10-in. pipe then branches into two 6-in. pipes with quite short curves which enter the wind belt of the cupola. There are two 4-in. pipes leading from the 6-in. pipes entering the cupola 12 inches above the tuyeres. We weigh all charges. The bed consists of 400 lbs. Lehigh broken coal and 400 lbs. of Connellsville 72-hour coke = 800 lbs. We then charge 2,500 lbs of iron and then three charges consisting of 100 lbs. of coal and 100 lbs of coke and 2,500 lbs. of iron. This makes 1,400 lbs. of fuel and 10,000 lbs. of iron a melting ratio of a little better than 7 to 1. We melt from 2¼ tons to 2¾ tons per hour.

We cannot give the blast pressure but the fan is too large for the cupola and we run it at a high speed.

We wish to increase the size of our melt in the same time that we now use and we also wish to be able to make heavier castings. We propose to increase the distance from the top of the sand bed to the bottom of the tuyeres by adding to the lower end of the cupola. We would like to know if this is the right thing to do and whether you would suggest other changes.

Answer.—As it takes 30,000 cu. ft. of air to melt a ton of iron your No. 8 fan can supply air enough to melt over 12 tons per hour if you had a cupola lined to 60 inches. For your cupola the 10-in. pipe is plenty large enough even with short bends. Your tuyeres are large enough but I would change the shape at the inside end to 3 in. x 8 in. and at the end against the shell 2½ in. x 7½ in. and keep the upper surface level. If the openings in the shell are 2 in. x 8 in. plenty of air will be admitted. Eight tuyere openings 2 in. x 7½ in. would give 120 sq. in. area. The 10-in. blast pipe has only 78 sq. in. area.

Your two six inch pipes have only 58 sq. inch area and on account of curves—valves and contracted entrances into the wind belt it is not enough. While you are about it I would use 8-inch pipes from the 10-inch pipe to the cupola and if it is necessary to flatten the pipes when they enter the wind belt increase the size at that point so as to get a total inlet area of 100 sq. inches.

You can add as much as you think best to the bottom of your cupola, making the distance from the bottom of the tuyeres to the sand bottom 18 in. or 24 in. or even more.

The deeper you make it the more melted iron it will hold but the larger will be your fuel bed and the less your melting ratio.

You should at once purchase a pressure gauge that will register 18 ounces and change the speed of your fan so that your highest pressure during a heat shall be 14 oz. or 16 oz.

I would give up the use of coal as soon as you have made the change, also stop up the upper 4-in. tuyeres.

Take a 3/8-in. bar of iron and bend two feet at one end at a right angle then lower it down through the charging door until the horizontal part is toward the center and 18 inches above the top of the tuyeres, mark the point when the rod touches the bottom of the charging door and bend the upper part out so that the rod will hang in the door and the lower end project towards the center of the cupola. Start your fire two hours before you want the iron done and put on say 500 lbs. of coke. When the coke begins to be quite red on top and you are sure that the wood is all burned out charge on enough coke so that the lower end of the bent rod will lie on it when the upper end rests on the door sill. Weigh the coke that is left of the 1,200 lbs. and you have the weight of your regular coke charge. The first day I would throw on about 4 in. more coke. Now charge 2,500 lbs. of iron placing the pig iron uniformly over the coke and breaking the scrap so that no piece will be larger than a pig and that no spaces shall be left.

The first day I would make the regular charges 200 lbs. of coke and 2,000 lbs. of iron and about 25 lbs. of oyster shells. Next day if your iron was hot at the start you can use the regular bed charge and afterwards perhaps you can decrease it. You can also decrease the regular coke charge.

The more coke you take off the faster you will melt, but don't take off more than 10 or 20 lbs. of coke at a time.

When you get the coke charges as small as you can without dull iron, you might increase your blast a little and you will have reached the limit of your cupola.

In charging your cupola you had better place a slag hole in the rear about four inches below the bottom of the tuyeres and increase the oyster shells if needed to make the slag fluid. If you keep the slag below the tuyeres you can run the cupola a much longer time without the slag becoming chilled.

Your next change would be a cupola 72-in. shell and lined to 54 inches. The third change would be a 60-in. lining and a change to a 12 in. or 16-in. pipe with long bends.

BRASS FOUNDRY NOTES.

BY C. VICKERS.

CORES FOR BRASS CASTINGS.

Inquiry:—"We are experiencing a good deal of trouble with the cores we use in our brass foundry, which in some places are 1/8-in. thick and others 1¼-in. thick, on account of blow holes. The cores are all shaped and made in halves and then pasted together before they are dry. The paste we use is a mixture of boiled water and rye flour."

Answer:—Do you vent these cores? What mixture of sand do you use? "Flour sand" is very apt to blow when used on small cores for brass castings. If you have been using it, change, and try linseed oil or a core compound. If the cores are too small to vent as in the case of the 1/8-in. core, use glue for a binder in your sand, and mix only a little at a time. The trouble with the 1¼-in. cores is probably caused by using too much paste and allowing it to close up the vent. If you have your vents clean and do not allow the metal to enter them 1¼-in. cores ought never to blow.

MALLEABLE CAST IRON NOTES.

BY DR. RICHARD MOLDENKE.

SELLING PRICE AND STRENGTH OF MALLEABLE CASTINGS.

M. E. writes us again on the above subject. In making up his estimated costs, he bases them on the established cost of the Tropenas Process, which is 1.50c, adds a molding cost of 1c a lb. Then estimates the other foundry and general expenses to be from three-quarters to one cent a lb. more. Thus his cost price comes out to be three and one quarter to three and one-half cents a lb. Naturally M. E.'s selling price would have to be higher.

In reply we would say that the Tropenas Process is a very good but expensive steel process, and not used for malleable castings, except in an experimental way, in Europe, as we have heard. The cost of metal in the ladle for malleable castings should not be over 1c a lb. with present pig iron prices. Molding cost will vary from one-half to three-quarters of a cent per lb. and the other foundry expenses depend on many things. It is these things which enable a firm to produce either at 2c a lb. or far above it.

The figures above should not be taken to mean that foundrymen should ask for low prices—far from it—but that the costs should be closely watched, and if much above what I have given as the selling prices in the May issue of the Foundry, the proper inquiries instituted and corrections applied.

M. E. further gives some interesting figures on tests with malleable cast iron. The tension tests will be understood by every one. The torsional test is a rare one for malleable castings. No test on malleable, however, gives more striking results when made in the shop. For instance, every display of twisted and bent malleable castings contains a large wrench with several turns made in the body. This looks beautiful, but does not mean much, as the actual bend per inch of length is really very small. In the test given below, it is interesting to note the number of pounds it took to twist the specimen through the given angle in the given length.

TENSION TEST.

Specimen approximately sound as cast, not machined: Mean diameter of specimen, 1 in.; ultimate strength, 36,600 lbs. per sq. in.; coefficient of elasticity, 27,800,000 per sq. in.; elongation in length of 8 ins., 2¼%.

TORSION TEST.

Mean diameter of specimen, .72 in.; torsional strength, 2,550 in. lbs.; amount of twist in 11 ins., 252°.

TRANSVERSE TEST.

Distance to center of bearings, 13 in.; depth of section, 4.01 in.; thickness of web, .32 in.; equal flanges, each 1.96 in. wide x .253 in. thick; moment of inertia of section, 4.4691; between central loads of 8,500 lbs. and 18,500 lbs. the increment of deflection was found to be .002 in. per increment of 1,000 lb. of load; between these limits coefficient of rigidity, 5,121,000 lb.; skin stress point of rupture, 48,000 lb.

COMPRESSIVE TEST.

Under a load of 150,000 lb. increase in area more than 25%.

It is difficult to comment on these figures except for the tensile test, as the transverse test has been made on a specimen unusual in shape for testing purposes. I would consider the tensile strength somewhat low. For the specimen in question, it should run about 40,000 lbs. upward, with an elongation equally as good as the one given.

If M. E. would use the test bars current in America for malleable castings purposes, we could give him a better opinion on the matter. Our method, as standardized by the American Society for Testing Materials, is to use a one-inch square test bar, the tensile strength of which shall exceed 40,000 lbs. per square inch, with an elongation of not less than 2½ percent, measured in 2 in. The transverse test of the same sized bar (this being broken on supports 12 in. apart), shall show a strength of not less than 3,000 lbs. with a deflection of at least ½ in. before yielding.

I will add that these standards are those current for the ordinary grade of good malleable castings. Specially good iron runs much better. For instance, I have made thousands of tons of malleable castings, the tensile strength of which never ran below 50,000 lbs. per square inch, and the transverse strength at the same time running nearer 4,000 lbs. with a deflection of over one inch, in fact sometimes nearer 2½ inches. This metal, however, requires the closest of attention, and a capacity for enormous production with high class furnaces and materials.

SILICON IN MALLEABLE CASTINGS AND MIXTURES FOR THEM.

G. A. B. writes calling attention to the fact that published analyses give silicon ranging as high as 1.33% in good malleable castings, while this department has quoted 0.45 as the best composition. The answer is that the best quality of malleable castings depends upon the state of the carbon in the metal before it goes into the annealing oven. Now the state of the carbon is a function of not only the silicon content, the temperature of the pour, but also of the thickness of the casting. The physical structure of a piece of "malleable" just as it is taken from the sand should be such that on breaking, the fracture is crystalline white, with a few spots of mottling noticeable on close observation. Where much steel is added to the mixture, even these spots should not be there, but on the other hand not the slightest signs of gas holes in the rim of the casting should appear either. Now to get this structure in the iron as it comes from the sand, the composition of the bath, so far as silicon is concerned, must be regulated carefully in connection with the thickness of the castings to be made. Thus, take the heavy malleable casting, requiring at the same time the very best qual-

ity of metal, such as was formerly used for the malleable "car coupler." Here 0.45 silicon gave just the desired structure for the metal which ran up to 1½ in. in thickness in some places. All lighter castings made with the same metal were also good, though for very light work, requiring much time to pour, metal with so low a silicon content will give trouble. For lighter work, it is found that the silicon can be increased considerably, and yet hold the carbon, which means the fracture of the white iron just as wanted. Hence for the general run of railroad work, where the metal is no thicker than five-eighths of an inch, the silicon content should be 0.65. Were this iron with 0.65 silicon cast into work of 1½ in. the resulting fracture of the broken iron would approach grayness, with resulting ruin of the metal in annealing it. Carrying out the argument further, for very thin castings, the silicon can be run up to 1.00 and even higher and yet leave the metal, as it comes from the sand, white and of good structure for perfect anneal. But if this metal were cast into thicker pieces, they would come out rotten from the annealing oven.

Where, therefore, an analysis shows 1.33 silicon, it refers either to very light castings, or else the metal was not of good quality. G. A. B. states that a well-known concern near Detroit makes castings with 0.80 silicon. This is all right, as that well-known concern makes castings of which several hundred often go to the pound. It is the section of the casting which requires the proper silicon, and this once correct for the heaviest thickness, is all right for anything lighter that can be run with the same metal.

G. A. B. further gives an analysis of "malleable" before and after annealing, asking if it is good. Here it is:

Silicon in the hard	0.80,	annealed	0.80
Sulphur in the hard	0.09,	"	0.09
Phosphorus in the hard	0.16,	"	0.16
Manganese in the hard	0.30	"	0.30
Comb. Carbon in the hard	2.40		
Graphite		"	2.25

The carbons of the above do not count for anything, as only the total carbon of the hard casting is reliable, the combined carbon and the graphite of the hard as well as annealed casting varying so much from skin to interior, that an analysis is correct only for the particular spot the sample is taken from, and not for the rest of the metal. In the above the sulphur will be noted at once as entirely too high. Good malleable should not run over 0.05. However, for very ordinary castings it will pass, but too much must not be expected from them. The manganese is also a little high for the casting. I would rather have it below 0.20 in the casting.

G. A. B. asks for information concerning the change in composition due to annealing.

The melting loss is about 0.35 for silicon, the sulphur gains 0.01, and with bad coal may increase as much as 0.10 and over that even, for the air furnace. With the open hearth, and with the best coal in the air furnace, the increase of sulphur and phosphorus should be only that of concentration, the bath shrinking in weight some 8 to 14 percent during melting. The total carbon drops, of course, but were better lowered by adding steel scrap than by refining out the carbon as in the steel process of the open hearth. Metal below 2.75 in total carbon gives trouble in the anneal.

G. A. B. finally asks if an iron made in Sweden with the following composition can be used for malleable castings: Silicon, 2.33; sulphur, 0.017; phosphorus, 0.043; manganese, 0.97. Not alone, but with other irons low in silicon and manganese, this iron should give excellent results. Irons which will give a mixture as follows with the above iron should do very well. Silicon from 0.95 to 1.30, depending upon the class of work; sulphur not over 0.04; phosphorus not over 0.175, and manganese not over 0.60.

Mr. W. G. Austin, of St. Joseph, Mo., has arranged to sell his foundry to B. W. Kyle, of the same city, and Mr. Kyle is planning to manufacture his washing machine on a large scale, running the foundry to its full capacity.

The Tallerday Steel Pipe & Tank Co., of Waterloo and Lemars, Ia., the Tallerday Mfg. Co., of Dolgeville, Cal., and the Kelly Foundry & Machine Co., of Goshen, Ind., have effected a consolidation by which the Kelly firm becomes financially interested in the Tallerday plants and by which shipments to fill orders will be made from whichever plant can handle the work to the greatest advantage.

Emilo Gutierrez expects to establish a foundry in the city of Guadalajara, Mexico, which will cost about $70,000.

ASSOCIATIONS AND SOCIETIES.

Philadelphia Foundrymen's Association.

Howard Evans, Secretary, care J. W. Paxson Co.

The 147th meeting of the Philadelphia Foundrymen's Association was held at the Manufacturers' Club, 1409 Walnut street, Philadelphia, on Wednesday evening, May 3, President Thomas Devlin occupying the chair. The secretary reported a balance in the treasury on April 5 of $2,190.12, and on May 3, $2,081.87, all bills being paid.

A letter was read from the American Foundrymen's Association in reference to the convention to be held in New York City on June 6, 7 and 8, inviting the Philadelphia Association to be present and to bring foundry friends to the meeting.

A communication from the chief of the Bureau of Manufactures, Washington, asking for general trade information, was referred to the executive committee.

Secretary Evans stated that at the June meeting the members would have the pleasure of hearing an address by a lady representative of the National Civic Federation.

The address of the evening was made by J. S. Robeson, of Philadelphia, who discussed "Some Core Binder Troubles." He referred to the various kinds of sands used in making cores, but particularly dwelt upon the binder and the characteristics it should have to produce the best results. The effect upon the efficiency of the binder produced by a change in sand was referred to and the speaker considered that many binders had been unjustly condemned because of variable results that had accompanied changes in sand. The paper in many of its features covered the same ground as the one which Mr. Robeson presented before the Pittsburg Foundrymen's Association at its February meeting. The speaker exhibited various samples of sand in use in foundries in Canada and the districts east of Pittsburg. The lantern slides were presented showing three cores: one made with rosin as a binder, another with a liquid binder, and a third with a dry binder. The paper was discussed at considerable length, particularly by foundry foremen present.

New England Foundrymen's Association.

Fred F. Stockwell, Secretary, care of the Barbour-Stockwell Co., Cambridgeport, Mass.

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, on Wednesday, May 10, at 5 p. m., Vice President W. B. Snow in the chair. The routine business was disposed of in the usual manner and applications for membership were received from the United States Graphite Co., Saginaw, Mich., and Joseph Dixon Crucible Co., Jersey City, N. J. They were unanimously elected.

The chair appointed Messrs. Miller and Stockwell as a committee to look up the matter of transportation to the annual convention of the American Foundrymen's Association to be held in New York City on June 6, 7 and 8.

The quiz topics arranged for discussion were then taken up. Below are given some of the questions and answers:

Ques. What is the best and cheapest method for melting brass and bronze castings?

Ans. We use a Schwartz furnace and melt a ton of clean castings for less than a ton of coal. We do not have any trouble and our crucibles are good. We do not have trouble with blow holes any more than anybody else, and our percentage is not so great. We use a very light gate. We pour our machine work just the same as iron.

Ques. Do you use an oil furnace?

Ans. We do not think we could use an oil furnace and get out the work we do.

Ans. For our work we think the old crucible furnaces are better. We use a gas furnace for white metal and aluminum. With our gas furnace we melt aluminum alloy with 90 percent aluminum. We carry 15 molders all on piece work. The gas furnace we find is very easy to handle and it is very clean.

Ques. What is the best method for molding brass and bronze castings?

Ans. We are making considerable work on the molding machine. We get quite a good size gate of small work in a flask 10 x 18 for 2½c per mold. On core work in the same size flask we pay 3½c per mold, and for a flask that has 50 cores, 5c per mold. Our loose work is very difficult. That is, the general run of electrical work is crooked and we pay 9¾c. Our work is all piece work, and it must be perfect, first-class work.

Ans. We run machines on our valves and pay 3c per mold. Of course, the bigger the pieces are the more we have to pay. We melt in a Rockwell furnace. If there are no cores in the molds we turn out about 90 molds per day, sometimes 100. If we have cores we get 60 or 70, sometimes 75.

Ques. Have you any special method for drying ladles?

Ans. We use the old method of drying our ladles. That is, we burn wood fires in them. We have plenty of old wood in the yard that would otherwise be going to waste.

Ans. We have a large room behind the cupolas with a tramway between the cupolas, and the ladles are run in on this tramway. There is a special arrangement of a frame with an iron hood over each ladle which covers the same, leaving room, of course, for a draft for the fire, and this hood is connected to a smoke pipe that carries away the smoke, etc. We burn wood fires to dry the ladles and find they do it very quickly and satisfactorily.

After a short intermission the meeting adjourned to dinner, after which the chairman introduced as the speaker of the evening Mr. M. McNaughton, of the Joseph Dixon Crucible Co., who addressed those present on the subject: "Graphite and Facings." At the conclusion of his remarks a unanimous vote of thanks was extended to Mr. McNaughton.

Announcement was made that the June meeting would be an outing and that full particulars would be mailed to the members later.

Pittsburg Foundrymen's Association.

F. H. Zimmers, Secretary, care Union Foundry and Machine Co.

The annual smoker of the Pittsburg Foundrymen's Association was held at the rooms of the Engineers' Society of Western Pennsylvania, Pittsburg, on Monday evening, May 1. The affair was well attended, urgent invitations having been sent to the foundry foremen and superintendents and pattern shop foremen to be present. Efforts are being made to organize a local association of the foremen and superintendents and the Manufacturers' Association of Pittsburg has given them the privilege of its rooms for meetings. The smoker was arranged by F. H. Zimmers, secretary, and the entertainment and repast were up to the high standard he has maintained in affairs of this kind. The following program of toasts had been prepared under the title "Confessions," and the responses proved the foundryman's capacity for unbending when other than severely technical matters are under discussion.

"Inside History of the Roll Industry," J. S. Seaman; "How to Manufacture Charcoal Iron Car Wheels without Charcoal Iron," A. W. Slocum; "How to Operate a Foundry in a Hay Loft," B. D. Fuller; "How to Finance a Program Committee," F. H. Zimmers; "Inside Reasons Why I Favor the Blower," William Yagle; "Guiding the Water Wagon," W. H. McFadden; "A Continuous Performance Foundry," S. D. Sleeth; "Philanthropy—Or Why I Give My Profits to the Foundrymen," J. S. McCormick; "The Molecular Antithesis as Affected by the Atomic Theory and its Application to the 'Molders' Delight'," H. E. Field; "Pyrometric Determinations of a Molder's Cranium 'the day after'," S. H. Stupakoff; "How I Developed the Southern Foundry Iron Industry," E. A. Kebler; "Picking Strawberries by the Wayside and My Trip to the Moon," D. J. Thomas.

Cleveland Foundry Foremen.

W. H. Nicholls, 608 Gordon Avenue, District Vice-President.

The first annual banquet of the Cleveland Club of Associated Foundry Foremen was held at the Hotel Euclid, Cleveland, Saturday evening, May 6, and was attended by nearly a hundred members of the club and their friends, including foundry owners, patternmakers, supply men and pig iron salesmen. The club has been in existence only a year, but has already accomplished much to advance the interests of the members and their employers. After cigars had been lighted at the completion of the menu, the president of the club, A. L. Hott, of the Interstate Foundry Co., called the meeting to order and after a few words of greeting, introduced Secretary W. H. Nicholls, who read an invitation to all connected with the foundry business in Cleveland to attend the annual convention of the American Foundrymen's Association, to be held in New York, June 6, 7 and 8. President Hott presented Mr. H. J. Boggis, of the Taylor & Boggis Co., Cleveland, as the toastmaster of the evening. Mr. Boggis introduced the speakers with a few well-chosen words.

Dr. Richard Moldenke responded to the toast "The A. F. A. and Its Work." He extended hearty congratulations to the foundry foremen of Cleveland on the successful inauguration of their club. He said that back of all such efforts in organization lies a dominant idea: the desire for more knowledge. "Let this be in lines social, technical, or financial; we simply must know all we can get hold of in our business; of each other's personality and character, and finally of those great movements of the day, all intimately tied up with finance." He declared that owners should welcome every movement on the part of all of their employes based upon the honest desire to acquire knowledge, for the owners are the

chief gainers. The foreman who has arrived at the time when ambition no longer impels him to climb to the next step, the management, and then the acquisition of an interest, will soon be ready for permanent retirement, and in an up-to-date foundry concern quickly lands there. "Long before you expect to enter into ownership, it would pay you to watch the iron and coke markets," said Dr. Moldenke, "and to compare the contracts your firm has with those of others. Much is to be learned of the movement of these fundamental materials of the industry by keeping track of things, especially from the pages of a first-class trade journal. The temptation is always a strong one to charge the highest price to the man who is not posted. Not only should you watch pig iron, scrap and coke, but also the supplies, such as structural steel, sand, cement, etc., for on going into business it is best to do so just before a rise is due. You thus get the lowest figures to buy, and when the plant is up, you can take work at the highest figures of the time, instead of vice versa when you build at the top notch. I advise you to get hold of specialties, to keep the shop a-going, whether times are brisk or dull. There is much comfort in knowing that even if the income is no more than the pay roll, a steadily increasing pile of stock stands ready for the first resumption of good times. Our industry has a wonderful fascination and few that have made castings themselves take to other lines entirely out of the industry. I believe our good friend Sercomb, of Milwaukee, who at last accounts is making soap, still regrets the change, though doubtless he makes more money cleaning humanity. When you take it all into your reflections over a tired year's work, you will agree with me in feeling that our effort is one of constant progress. Next week we expect to know more than we do today, or at any rate should do so. It is this feeling that has led to the formation of foundrymen's associations. It has led to the formation of your own society. It will lead to the formation of others. For the sake of our nation's progress, we wish them all Godspeed, and we try to help them along with good hard work and investigation. Had it not been for the concerted work of our metallurgists in the American Association, we would not be buying nearly all our pig iron under chemical specifications, nor would our better posted foundry foremen write out mixtures at their desk without worrying how they will turn out.

"I am repeatedly called in on expert work in foundries, and have always found the foremen most anxious to learn the simple little trick of arithmetic by which a mixture can be figured out from the stock piles, the analyses of which are known. The effect that such calculations have on the buying of the iron is seldom realized by the owner. As just an instance of this, I will quote from my own experience. Where formerly the works in question had all the way from 10,000 up to 17,000 tons of pig iron in stock, as many varieties had to be carried to mix from. After I had mastered the principles involved in the work, that stock was cut down to less than 3,000 tons, and oftentimes I had to worry about the iron due for a week to follow, when delays by rail will occur. Just think of the interest on the former investment saved. How much more could be said on the subject of the foundry and our particular hobbies in it. We get together and think we have threshed it out so dry that nothing worth talking about is left, and behold, when we come together once more, it is—Have you seen this or that shop, and the way they turn out those propeller castings? Or a new instance of how the pattern shop did the foundry that time, or vice versa. If there were not so much new constantly turning up, how could we have such bright trade journals as the *Foundry* and the *Patternmaker?* Our conventions seem to teem with interesting matter, and I take this occasion to extend to each and all of you, as well as all foundry Cleveland, a hearty invitation to join with us in New York City next month, when we hope to have a most interesting gathering of foundrymen from all over the country. May the good work go on here. May you become thoroughly acquainted with each other; learn to value and respect the earnest efforts and good citizenship which will be found in our industry. I greet you again as fellow-foundrymen, on the right road to progress, success, and that prosperity which we all strive for with American pluck, American ability, the American perseverance."

John A. Penton, of the Penton Publishing Co., spoke on "Early Reminiscences of the A. F. A." He told of the first meeting in Philadelphia of a few men interested in the foundry business to organize a local association of foundrymen, and how from that small beginning the national organization grew. Mr. Penton made a strong plea for the organization of foundrymen, saying that it is based on the de-

sire of men in the same business to be associated with their fellow men and is absolutely necessary for the highest success in the business world. He said that if a man were not entirely in harmony with the plans and methods of an organization, that was no reason for his refraining from becoming a member. He ought to go into the organization and exert his influence to have it changed to conform to his ideas.

N. S. Calhoun, of the Johnson & Jennings Co., responded to the toast, "Cleveland as a Foundry Center," making a speech abounding in humor and giving the guests a few solid facts on which to reflect. Other speakers were: "Cleveland Club of Associated Patternmaker Foremen, Its Object and Work," J. Nall, of the Ajax Mfg. Co.; "Proper Relationship between the Pattern Shop and the Foundry," Alfred Hibbs, of the U. S. Cast Iron Pipe & Foundry Co., and "Making a Molder," H. M. Lane, editor of the *Foundry*. Mr. Lane spoke of the tendency towards specialization in the foundry which prevents a boy from obtaining a thorough knowledge of the whole foundry business He urged the importance of an apprentice knowing something about the machine shop and patternmaking as well as about molding, and outlined a plan for the establishment of a shop school, which he believed would result in turning out a much higher grade of molders than can now be found. He said that the product would be a well-developed mechanic instead of a man trained in some special feature of the foundry trade.

Buffalo Foundrymen's Association.

The regular monthly meeting of the Buffalo Foundrymen's Association was held in its headquarters, 23 Builders' Exchange, on Tuesday, May 16. President Hubbell, 28 members and several visitors attended. After the regular order of business was disposed of the chair introduced Mr. Daniel Upton, Supervisor of Manual Training, Buffalo Public Schools, who, in a very interesting talk, explained the advantages of manual training offered at the Mechanic Arts High School to the young men of this city. This school has an excellently equipped pattern shop, 18 wood-turning lathes, a cabinet shop with 24 work benches, a shop equipped with 20 forges, and several draughting rooms. One of the basement rooms has been fitted out as a molding room where the boys take lessons in molding before they enter the pattern-making classes. The machinery is driven by electric motors. The branches of industrial training are as follows: First year, cabinet work and wood turning; second year, molding and pattern making; third year, iron forging, brazing, tempering, etc.; fourth year, machine shop practice. In each year the draughting conforms to the other work, the course as laid out consisting of free hand and mechanical branches; the latter takes in machine and allied subjects in the last two years. The aim is not to produce specialists in any line, but to develop the whole man by educating the hand and mind to work together. The boy is, therefore, better fitted to enter a larger field of usefulness. At present about 150 boys are taking the technical course though it has been established only about two years. It was the unanimous sentiment of those present that if our boys are educated in this school our manufacturers will in a few years have a better grade of mechanics.

The Associated Foundry Foremen.

Frank C. Everett, Secretary, 2113 Third Ave., New York. N. Y., care the J. L. Mott Iron Works.

Milwaukee Foundry Foremen.

Thomas Glasscock, Dist. Vice Pres., care Pawling & Harnischfeger Co., Milwaukee, Wis.

Erie Foundry Foremen.

W. F. Grunau, Dist. Vice Pres., care Erie City Iron Works.

PHILADELPHIA FOUNDRY FOREMEN
W. P. Cunningham, Secretary, Pencoyd, Pa.

NEW YORK FOUNDRY FOREMEN'S ASSOCIATION.
S. M. Williams, Dist. Vice Pres., 221 Third Street, Elizabeth, N. J.

CHICAGO FOUNDRY FOREMEN.
David Spence, Dist. Vice Pres., 142 Bunker St.

INDIANAPOLIS FOUNDRY FOREMEN.
W. H. Holmes, Dist. Vice Pres., care American Foundry Co.

HAMILTON, ONT. FOUNDRY FOREMEN'S ASSOCIATION.
A. Chase, care Sawyer & Massey Co., Secretary and Treasurer.

A. E. Stevens, Sioux City, Ia., is organizing a company to engage in the manufacture of cast iron and brass products. The concern will be known as the Western Brass & Iron Foundry.

AMERICAN SOCIETY FOR TESTING MATERIALS.

Dr. Richard Moldenke delivered an address upon "The Object of the American Society for Testing Materials" before the Civil Engineers' Club of Cleveland, on Friday, May 5. The speaker first reviewed the organization of the societies for testing materials in Europe, which resulted in the formation of the International Society for Testing Materials with divisions in each country. He noted the fact that the object of the societies in this country and Europe is radically different. In this country the prime object of testing and of the Society for Testing Materials, is to arrive at standard specifications for material used for manufacturing purposes, while in Europe the prime object of testing materials is for scientific research, and the making of specifications is a secondary matter. In many cases the European members of the society are government officials and they would have no authority to adopt standard specifications without special legislation on the part of their government. The engineering departments of each of the European governments have their own specifications and it would be very difficult for them to unite on any universal plan. In this country however, engineers feel the need of universal standards and specifications, and hence the American Society for Testing Materials, which is the branch of the International Society, was formed. This society has taken over most of the testing work previously done by various engineering societies, or it has worked in harmony with other engineering bodies, and from its work has resulted the adoption of standard specifications for many lines. There are now a number of committees working upon the subject.

Dr. Moldenke told of his visit to the International Congress held at Buda Pesth several years ago. There were only four American members present, and in the committee work he acted as interpreter between the various divisions. The proceedings of the International Congress for Testing Materials are conducted in three languages, French, German and English, there being two translators always on the platform, and just as soon as the speaker makes a few statements, each translates it into his own language for the benefit of his fellow-countrymen present.

After pointing out the importance of the work already done by the American Society, Dr. Moldenke made a plea for all engineers to support the work of the society by becoming members, taking part in the discussions and assisting the work in any way that they could.

MEETING OF THE IRON AND STEEL INSTITUTE.

The annual meeting of the Iron and Steel Institute opened at London, May 11, with Andrew Carnegie presiding. In his farewell speech, and before introducing his successor, R. A. Hadfield, who was vice president of the Institute, Mr. Carnegie said he appreciated the honor of being the first American president of the Institute. Later he subscribed $25,000 to the research fund as a parting gift to the Institute. One of the features of the meeting was the reading of a paper by James Gayley, of New York, on "The Application of the Dry Air Blast to the Manufacture of Iron." R. A. Hadfield, the new president of the Institute, was formerly master of Sheffield, is director of the Sheffield Gas Co., the Sheffield District Railroad, and several other companies. He is the inventor of manganese steel, a member of many scientific and industrial organizations, including the American Institute of Mining Engineers, and among the prizes he has received is the John Scott medal, a premium of the Franklin Institute of Philadelphia.

ALUMINUM AS A PATTERN METAL.

BY H. N. TUTTLE.

There has been so much said against aluminum for metal patterns, that those who have never used the metal for that purpose would be naturally inclined not to give it a trial; whereas, if one has thoroughly investigated the matter, he finds merits in it, which make it the metal "par excellence" for many classes of metal patterns.

In the first place, its extreme lightness is a very valuable feature. The specific gravity of aluminum is 2.56, while that of brass is about 8.32, and zinc and tin alloy or antimony and tin about 7.25. From this will be seen that with a given size gate, aluminum patterns of three times the volume of brass or soft alloy patterns may be carded with only the same liability of breaking the soldered joint So. in considering patterns of the same size, carded with gates of the same size, the danger of breaking the joints of the aluminum card would be very much less than that of the other.

Molders like aluminum patterns on ac-

count of its being so much easier to draw a light pattern than a heavy one.

The cost of the metal is less than that of almost any other pattern metal. Aluminum costs about thirty cents per pound, and as its volume is three times greater than brass or other pattern alloys, its comparative cost is reduced to ten cents per pound.

It is sometimes said that the sand sticks to aluminum patterns more than to other kinds, but after examining about three hundred cards of various metals, to observe the amount of dirt remaining on the patterns after they were brushed off, and after talking with several of the molders who have used these patterns, it was found that it was not true, in this shop at least; there being no appreciable difference in this respect.

Aluminum finishes with the file, sand paper, scraper, etc., much easier than brass or the hard pattern metals, and casts smoother than the soft alloys. It is very stiff and will not easily spring out of shape nor be easily bent, making it better for light, flimsy patterns than the soft alloys; while, on the other hand, it is somewhat soft, so that it will not peen out of true from rapping, as flat, thin iron patterns do. Still, if an aluminum pattern be sprung slightly in casting, or in any way, it may be trued up by bending, though it will not bend so much as brass.

Of course, it is not claimed that aluminum is better for all classes of metal patterns, but for ordinary carded work for castings not requiring extreme accuracy or fine surface, such as agricultural and light machine work in general, and for single patterns too large to card, as gears, hand wheels, etc., it makes durable, cheap, and easily finished patterns.

Soldering Aluminum.

The objection most often heard to aluminum as a pattern metal is that "it can't be soldered," or that "it is extremely difficult to solder," or that "a good joint can't be soldered." Now it is proverbially hard to prove a negative, and it is especially true in this case. The chief difficulty in soldering aluminum lies in not knowing how. It is not generally known that a fair job of soldering can be done upon aluminum with common half and half solder, but such is the case. We have patterns which have been in use a long time upon which are shrinkage holes soldered with the common solder. It is only necessary to follow the directions given below for using aluminum solder, using no flux. Also, aluminum with 10 percent tin added will solder better with common solder. However, a special aluminum solder is much better, making a stronger job, and being easier to use. We have been experimenting and testing aluminum solders for several years, and have found the one below to be the best, considered from all points, for metal pattern work. It is slightly different in color from aluminum, which makes it useless for ornamental work, but it is cheap, easy to use, and very strong and durable. We have made test joints with it which have stood more strain than the aluminum itself, the casting breaking at one side of the joint, though, of course, this is not usually the case. The receipt for this solder is as follows, all parts to be measured by weight:

Aluminum	1 part
Phosphor-tin	1 part
Zinc	11 parts
Tin	29 parts

In making this solder, melt the aluminum first. Then add the zinc in small pieces, so as not to solidify the already melted aluminum Then add the tin, taking the same precaution not to solidify the metal, and lastly, drop in the phosphor-tin, stir well with a brass rod, and quickly pour into molds, which may be easily made in the open sand. Use a crucible in making this solder.

The reason for observing the above order of melting is that if the metal with the lower fusion point were melted first, and then brought up to the temperature necessary to melt the aluminum, the lower metal would be over-heated and partially vaporized, thus destroying the proper proportion.

In regard to using the solder, it is well to understand a few points about aluminum oxide. This oxide is a thin film or skin which forms upon the surface of aluminum immediately upon its coming in contact with the air. This oxide forms practically instantaneously, so that if a scraper or other instrument be pushed across the surface of the metal, the oxide forms before the bare metal comes in sight. It also forms upon the molten metal, and it sometimes happens in pouring, that the workman finds he is pouring his metal through a tube of oxide. It also sometimes happens that when he over fills his flask, and the metal runs over the side, in the case of heavy casting, a film will form around the overflow, and syphon quite an amount of metal from his sprue, unless he prevents it by breaking the skin.

The oxide is very durable and impervious, so that it prevents the air from reaching the inner metal, and thus further oxidization is very slow. In the case of iron, the oxide is, we might say, very porous, so that the first thin layer of oxide has little effect in reducing further oxidization.

It is the presence of small scales of oxide through the body of the casting, which renders the metal porous, and unfits it for pump work, upon castings which are subjected to hydraulic pressure.

Now solder will not adhere to any metal covered with oxide. In the case of brass, the oxide is removed by the flux, but there has been no flux discovered which will remove or dissolve aluminum oxide. However, the difficulty is overcome in a very simple way. The soldering copper, which should be a rather heavy one, and untinned, is heated to a dull redness, and then rubbed back and forth upon the surface to be soldered, melting the solder upon the hot copper at the same time. The surface becomes covered with the melted solder, which excludes the air and prevents further oxidization, while the point of the copper scratches off the oxide already there. Under these conditions the solder readily adheres to the aluminum, and the surface becomes "tinned." For filling shrinkage holes, or building up additions upon patterns, all that is necessary now, is to melt in the required amount of solder.

In case it is desired to solder two pieces of aluminum together, both surfaces should be "tinned," the pieces brought into position and the joint heated with a copper or blow-torch until the solder is liquid, then pressed into place and allowed to cool. Brass must be heated to 460° before solder will adhere to it, while aluminum must be heated about 200° higher, so it will necessarily be a little harder to solder aluminum than brass.

There is a certain stage during the cooling, just before solidification, when the solder may be worked into any shape, at will, like snow, when it is right for packing, or like the amalgam used by dentists. Of course this temperature is hard to maintain, but the temperature at which aluminum "tins" nicely, is nearly at the "wiping" temperature, as a plumber would say, and on this account there is time enough to "strike off" surplus solder, in simple cases.

As an example, suppose it is desired to "build up" a certain surface of a pattern, one-half inch. First "tin" the surface to be "built up." Then place a wooden frame around that part of the pattern, so that its upper edge is in line with the desired finished surface. Then melt in with the copper, enough aluminum solder to fill the frame "heaping full." After rubbing the copper over the bottom and around the corners, to be certain that the solder is melted into the "tinned" surface below, when the solder cools to just the right temperature, "strike off" by "patting" with a block of wood, using the top of the wooden frame as a guide. Sometimes the "striking off" can be better done with a piece of smooth steel, like a scraper.

Fillets may be "wiped" in corners with a common waxing iron with nearly as much ease as wax fillets. The corner, after being "tinned," has a little solder run in, and immediately followed by the waxing iron, which if done at the proper moment, presses the solder into shape, leaving it as smooth as glass, and requiring no further finishing.

These are merely simple examples of what may be done in the line of "striking" solder. In case of any large or complicated jobs, it is better to rig up some kind of heating table, so that the temperature of the casting may be maintained.

Sometimes additions may be more easily cast on than soldered and swept off. In this case the addition may be put upon the pattern in wood, wax, or in any convenient way and the pattern rammed up. After the pattern is drawn and the addition removed, the proper surface is tinned and the pattern replaced in the mold. After the mold is closed, the addition is cast on by pouring in melted aluminum solder at a high temperature. Gates which have been broken off are sometimes replaced in this way.

Casting.

Another objection to aluminum often heard is, that "it is hard to cast." However, it is only necessary to observe a few conditions to make the casting of aluminum as certain as that of any other metal. It should be borne in mind that aluminum melts at a higher temperature than soft alloys (about 1200°), is much lighter than any other pattern metal, and has the property of absorbing gases when over-heated, or when kept in a molten state for any length of time. On account of these properties, aluminum should be handled somewhat differently than the other metals.

The most important thing to remember is to use a large sprue and a large gate, so that as the casting chills, it may "draw" from the

metal in the sprue, and thus not leave shrink holes in the casting itself. For this reason the gate and sprue must be of such size that they will remain in a liquid state, longer than any part of the casting proper. After a little practice, the workman will be able to judge how small a gate it will be safe to make for any given casting. However, it is better at first to be on the safe side with the larger gate, as it is cheaper to saw off a little more metal than to solder a shrinkage hole.

As a general rule, it is better to gate into the heaviest part of the casting, as this is the part which cools last. If it is difficult to do this, or if there be more than one heavy or enlarged part to the pattern, "risers" may be put on to feed in the shrinkage. It is absolutely necessary to put a riser on any heavier part of the casting, which is separated from the gate by a thinner section, to prevent a shrinkage.

On account of its lightness, an extra "head" is not of so much advantage as in other metals. From the same characteristic, top gating may be more often employed, as its lightness very greatly reduces the probability of "washing."

Pulley patterns, sprockets, small gears, etc., may be best cast by setting the sprue upon the cope print, or on the hub.

The form of sprue to be recommended for top pouring is shown in Fig. 1. This form gives a larger body of metal for the same size gate, than the ordinary shape. If, after the cope is lifted off, the sand is pressed or cut back as shown at C, the sprue may be broken off at the line A and B, without the use of a saw.

The sand should be tempered as dry as can be conveniently worked, as the metal is so light that it cannot overcome the steam pressure as well as a heavier metal, and blows are more apt to be caused from wet sand than in any other way. This is especially true in case of "pockets" of sand in the drag, surrounded by metal. This makes it sometimes necessary to vent down to the bottom board, to prevent a "blow." Another essential point is to pour the metal at the proper temperature. The rule is, "to pour at the lowest temperature that will fill the mold," which in most cases is but little above the melting point. The most convenient way for testing the temperature, is to place the end of a pig of aluminum about three-quarters of an inch into the molten metal, and allow it to remain there a short time. If the metal is "hot," its degree may be determined by the rate at which it melts the pig. If the metal is near its melting point, a little cup of the congealed metal will be formed around the end of the pig. After the pig is withdrawn, the time it takes for this "cup" to become remelted, will give a very accurate idea of its temperature. After losing a few castings by pouring too cold, the proper heat may be easily judged.

As the metal is poured at such a low temperature, it is always well to ram the sand as lightly as the mold will stand, to allow the easy escape of the air and gases, but should it be necessary to ram the mold hard, it should be thoroughly vented. Another reason for ramming lightly, is that the property called "hot-shortness" is very much in evidence in the case of aluminum. That is, the metal is very weak, just after solidification, so that in certain shapes, such as an open ring, if the sand is rammed very hard, there will not be sufficient strength to the casting upon shrinking, to crush in the sand; the result being a broken casting. The remedy lies in proper ramming.

For this same reason, it will be found safer in casting around cores of more than three or four inches in diameter, to use a soft baked core made of molasses water and molding sand. This crushes as readily as green sand. Also the castings should not be shaken out too quickly after pouring.

Since aluminum has the property previously mentioned, of absorbing gases when in a molten state, it should be poured soon after melting. It should not be allowed to remain in the fire and "soak," as the gases absorbed tend to produce blow holes.

The metal should be poured very rapidly, literally "dumped" into the mold. This will help fill the mold, when otherwise the metal might be too cold to run up into the cope corners.

For melting the metal, a gas furnace is the most convenient outfit. Catalogues describing these may be obtained at any gas company's office.

Coke makes a very good fuel, especially if there be much casting to be done at one time. Charcoal is inconvenient on account of its burning out so rapidly, though it is a very clean fire.

Soft coal is not to be recommended, as it is dirty and gaseous, but for a quick short job, it is very good. When it is used, care should be taken not to get any particles of the fresh coal into the melted metal just previous to

pouring, as these make small blow holes, slightly below the cope surface. Though these generally remain below the depth of a file cut, they will show if the casting be finished in the lathe.

An iron ladle, or black lead crucible may be used, an iron ladle being rather more convenient, but burning out in the course of a few months' usage. In either case it is more convenient to use a ladle or crucible large enough to hold all the metal a man can handle. Also there should be a long sand-bin with a goodly quantity of sand, so that the patternmaker can ram up several molds, and pour all at once, immediately upon the metal in the large pot becoming melted. Of course this last applies merely to small shops.

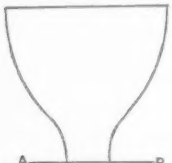


Fig. 1

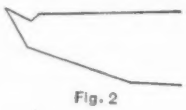


Fig. 2

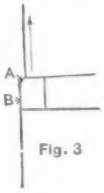


Fig. 3

Snap molds need not be jacketed in case of light castings, and seldom need weighting or clamping to hold down the cope.

If the castings be shaken out soon after they are poured, and a shrinkage hole should be found, which will be rare if the above rules are followed, it may be easily filled by rubbing a stick of aluminum solder upon the proper surface, while the casting is still hot enough to melt the solder. Yet the casting should not be too hot, as the solder will merely run into the casting itself.

A 3-16″ shrinkage rule is the proper rule to use, though the shrinkage will vary from this slightly under different conditions.

The gates for aluminum patterns should ordinarily be made of rolled sheet brass, cast in as in soft alloy patterns. An anchor hole should be drilled in the end of the brass, as the aluminum will not weld to the brass. It is well to use brass about one-eighth of an inch thick for gates when possible. When very heavy patterns are gated, the aluminum sometimes melts the end of the brass gates, causing blows in the casting, and loosening the gate. This trouble may be overcome by using sheet phosphor-bronze in place of brass.

Finishing.

One of the greatest advantages of aluminum for patterns, is that it finishes so easily. A few points will be touched upon here. For sawing off sprues, which cannot be safely broken off, a common hack saw is generally used, but a fine tooth panel saw, about fourteen inches long, sharpened hack saw style, or like a wood rip saw, is much better, as it saws faster and more accurately. An old fine tooth circular saw is sometimes used where there is much sawing to be done. Regular metal cutting circular saws and metal cutting band saws may be bought which do very rapid work.

Aluminum files nicely, the scale not being appreciably harder than the inner metal. It has a slight tendency to "pin up" on the file, and scratch, this tendency varying much with the individual file, and with different castings, some files not "pinning" with any casting, and some castings not "pinning" with any file. This tendency may be overcome almost entirely by dipping the file occasionally in water. Some workmen say that this makes the file cut much faster, also.

There is a file made with a very oblique cut, which will not fill up with even the softest metals. This is a bastard cut file, the main cut being made on an angle of only 40° with the side. The second cut is made very light. This file works very nicely upon aluminum, and is generally used by the writer.

Much of the finishing may be done upon the disc grinder. Should there be none in the shop, a fairly good one may be made by covering a large wooden face plate with garnet paper, running at quite a high speed in the turning lathe.

For finishing inside cylindrical surfaces, such as journal bearings, sand-paper rolls may be made and used in the lathe. It is well to have several of these rolls of various sizes on hand.

By using the finest grade of Albany sand (Windsor Locks sand is often used) and taking care in the molding, very smooth castings may be produced, which may be very quickly finished well enough for common work upon the rotary wire scratch brush. This may be purchased for about ten dollars, and put upon an emery wheel arbor, and run at a high speed.

When using hand scrapers, or floats, and when drilling, tapping or turning, kerosene may be used as a lubricant. Of course water or benzine would be as good, but water rusts the machines, and benzine or naphtha evaporate

rapidly and are unpleasant upon the hands.

The proper speed for turning is about the same, or a little less, than that for brass, while the tools should be ground with considerable rake and clearance, about the proper amount being shown in Fig. 2.

The top view of a very nice working lathe tool is shown in Fig. 3, in which the feed is in the direction of the arrow. The round corner A makes the roughing cut while the flat edge B, the finishing cut, both at one operation. By grinding tools this shape, 1-32 of an inch is about all the stock that is necessary to allow for turning. Turning tools should be placed at or slightly below the center of the work.

TROUBLE WITH THE FOUNDRYMAN.

I noticed recently a piece with the above title by C. E. W. I see no reason why his piece could not be made in the three-part flask. In the case of a large piece I think it would be perfectly safe to ram up the cheek and drag, remove the drag, take out his loose pieces, return the drag, roll over and finish the same without any fear of bad results from ramming his cope with the loose piece out. If there was any fear from this cause, however, he could roll back and take them out after the cope is rammed up. As he has no finish marks on it, it may be that it would be more simple to leave his other strips loose and then to ram level with them, take out the strips and lay on a flat core, thus making it a two-part flask. We have a similar piece, which is a heavier casting but has a smaller core, which we have made twelve or fifteen times.

W. S. SHATTUCK

TRADE PUBLICATIONS.

The Corrugated Grinding Wheel Co., of Philadelphia, Pa., has gotten out a circular illustrating its corrugated wheels and setting forth the advantages to be derived from their use. The catalogue shows a half tone from a photograph taken of a piece of cast iron ¾ in. thick, with a groove cut in each end of it. A groove was cut in one end by a wheel when not corrugated, and a grove was cut in the other end by a corrugated wheel, a specially designed testing rig being used to force the work against the wheel. The corrugated wheel did 140 percent more work than the other.

The A. A. Griffin Iron Works, of Newark, N. J., have gotten out a very neat little trade publication in regard to the Bundy traps, which is entitled "About Myself" and is supposed to be an autobiography of the trap. It starts out with a picture of the author and then describes its various uses. It is 3½ by 6 inches, and well illustrated.

Clum & Atkinson, of Rochester, N. Y., have gotten out a very neat publication, describing and illustrating the work of their brass, bronze and aluminum foundry. It is a pamphlet 6 by 4½ inches and contains a considerable amount of very interesting matter.

The Yale & Towne Mfg. Co., Stamford, Conn., has just issued two very neat little catalogues, 6 x 5 in. The first deals with the Yale & Towne blocks and electric hoists, showing the different types of hoists and the applications for which they are intended. In the back of the catalogue there is a map of New York City. The other catalogue deals with locks and hardware intended for railroad use. These two catalogues were gotten up for distribution at the International Railway Convention, which has recently been held in Washington, D. C.

The Bristol Co., of Waterbury, Conn., has issued another catalogue of its recording thermometers. The catalogue is gotten up in an exceedingly neat style, including illustrations of each class of thermometer with a description of the special service for which each is fitted. It also contains considerable matter of interest to all users of recording thermometers and to all who have work to do along this line.

One of the best gotten up trade publications that has come under our notice lately is that entitled "Cranes," which is sent out by Pawling & Harnischfeger, Milwaukee, Wis. It is the seventh edition of their catalogue. The book is 12 x 9 in. and contains 40 pages illustrating practically every form of hoist rigging used in modern manufacturing plants. These include traveling cranes of all types and for all classes of service, yard cranes, traveling jib cranes, standard and special jib cranes, extension cranes which are sometimes called rubber necked cranes, and power and other trolley cranes for all classes of work both indoors and outdoors. Any one interested in crane problems should have a copy of this catalogue.

PERSONALS.

Mr. J. A. Babcock, who has been foreman of the Lakeside Foundry in Muskegon, Mich., has gone to Lansing, Mich., where he will be employed as foreman at the Lansing foundry.

Mr. F. C. Myers, late manager of the Indiana Foundry & Machine Co., South Bend, Ind., has accepted the position of superintendent of the Illinois Foundry & Engineering Co., Granite City, Ill. The latter company has recently increased the capacity of its plant.

Mr. John McGregor has resigned his position as foreman with the Doherty Mfg. Co., of Sarnia, Ont., and has accepted a similar position with Bowes, Jamieson & Co., of Hamilton, Ont.

W. B. Chapman, formerly general superintendent of the Mashek Chemical & Iron Co., Escanaba, Mich., who left Escanaba two months ago, is now engaged as assistant manager of the New York office of the Morgan Construction Co., composed of engineers, founders and machinists, with headquarters at Worcester, Mass.

DEATHS.

Mr. Henry W. Miller, president of the Utica Pipe Foundry Co., of Utica, N. Y., died of heart failure in Chicago on May 10. Mr. Miller was 58 years old and has been prominent in the manufacturing interests of Utica for a long time. He was in Chicago receiving treatment for heart trouble.

Wm. Tod died at his home in Youngstown, O., April 27. He had been suffering from organic heart trouble for two years, and his death was not unexpected. Mr. Tod was a son of David Tod, one of Ohio's war governors, and was born at Warren, O., July 30, 1843. He received a common school education and in 1868 became connected with Homer Hamilton in the foundry business, later manufacturing the Porter-Hamilton engine for general power service and especially for the iron and steel trades. Mr. Tod became an important factor in this business. Associated with John Stambaugh Sr., Paul Jones and Homer Hamilton, the plant was built up and in time and the firm became known as Wm. Tod & Co. At a later date the business was incorporated as the Wm. Tod Co. Mr. Tod was elected president and the company became one of the most important engine builders in the country. Mr. Tod was also interested in the Brier Hill Iron & Coal Co., the Youngstown Steel Co., and other manufacturing concerns. He leaves two sons, David and Fred. David Tod is general manager of the cement department of the Struthers Furnace Co.

FIRES.

Fire broke out in the plant of the Stockton Iron Works, Stockton, Cal., April 19. The largest building of the company, valued at $8,000, was completely gutted, and a number of valuable patterns, the accumulation of 40 years, worth $50,000, were entirely destroyed. A small insurance was carried on the buildings. The company will rebuild as soon as possible.

Fire visited the plant of the Fagan Iron Works, Jersey City, N. J., last week, destroying the foundry, a two-story engine and boiler room and a four-story pattern shop. The older portion of the plant was saved, but a large number of valuable patterns and considerable machinery were destroyed. The estimated loss is $10,000.

The foundry building of Thos. Taylor, of Falls City, Neb., was destroyed by fire on April 20. The loss is between $3,000 and $4,000, with no insurance.

Fire in the warehouse and salesroom of the Illinois Malleable Iron Co., Chicago, May 3, caused a loss of $10,000.

The foundry and machine shop of Rittenhouse Bros., at Norristown, Pa., was damaged by fire to the extent of $35,000 on April 25. The fire started in the pattern room on the second floor.

The Plainfield Foundry Co.'s plant, of Plainfield, Conn., was destroyed by fire on May 3.

Fire destroyed the foundry and the entire works of the Desjardins shops at St. Andre, Kamouraska, Quebec, on April 26. The loss is estimated at $150,000, upon which there is some insurance.

The Gurney foundry at Toronto, Ont., was slightly damaged by fire on May 4.

The Chicago Foundry, of Spokane, Wash., was damaged by fire to the extent of $1,000 on April 12.

The Summit Stove Foundry, of Geneva, N. Y., was damaged by fire to the extent of $3,000 on May 4.

NEW CONSTRUCTION.

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., has let contracts for two additions to its plant which will require an expenditure of about $35,000.

A building permit has been issued to the Pittsburg, Ft. Wayne & Chicago Railroad to build a brass foundry to cost $20,000, in Pittsburg, Pa.

The Reading Iron Co., of Reading, Pa., has let a contract for a new foundry building 180 by 230 ft.

The buildings being constructed by the American Steel Foundries at Chester, Pa., are rapidly approaching completion.

The addition to the foundry of the Macungie Brass & Mfg. Co., of Macungie, Pa., is nearly completed.

The Ajax Metal Co. will construct a new fire proof pattern loft at 52 Richmond street, Philadelphia, Pa. The loft is to be built of steel and the contract for it has been let to Mitchell Bros., of Philadelphia, Pa.

The Vulcan Foundry Co., Hamilton, O., has purchased land for the erection of a new foundry, and expects to be under roof by November.

The Ohio Pattern Works, of Cincinnati, O., is having plans made for a large pattern plant to be erected on Spring Grove avenue, in Cincinnati, O., the building to cost about $10,000. The plans are being prepared by Architect Martin Fisher.

The Southern Indiana railway shops, at Bedford, Ind., will be extensively improved, and plans call for the construction of a large foundry and improved machinery facilities.

A contract has been closed for the cement and some of the materials for the $400,000 plant of the Twin City Rapid Transit Co., of Minneapolis, Minn. Among the other large buildings there will be a foundry 60 by 200 ft.

The Olds Motor & Gasoline Engine Works, of Lansing, Mich., will erect a foundry 240 by 160 ft.

The Fagan Iron Works, Hoboken, N. J., are rebuilding their foundry which is 200 by 100 ft. and putting on an iron roof.

The Gray & Dudley Hardware Co. has completed arrangements to start a large foundry and hardware manufacturing plant at Nashville, Tenn., and has purchased a location of about 11 acres for this purpose. The company will manufacture a varied line of hardware and cast iron goods, and will employ about 150 hands.

Arrangements are being made for a number of improvements and additions to the Central Foundry Co.'s plant at Bessemer, Ala.

The Davenport Foundry & Machine Co., of Davenport, Ia., has had plans prepared for a new foundry 88 by 100 ft., by Architects Claussen & Claussen. It also intends to enlarge the main building of its plant, which is 42 by 125 ft. This building is at present only one story in height. The roof will be raised and another story added, which will be used as a pattern shop.

The Hawthorne Foundry & Machine Co. will move its plant to Des Moines, Ia., from Grinnell, providing a suitable location can be found. The railroad facilities at Grinnell were inadequate.

John T. Carmody, of Cedar Rapids, Ia., is improving his new foundry plant by adding a new office building, constructing some cement flooring and making other improvements that will facilitate the work.

Emrick Bros., of Hastings, Neb., have repaired the damage which was done by fire recently and are once more ready for business.

The United States Radiator Co., Dunkirk, N. Y., has just completed an addition to its foundry which will give an increase of about one-third of the former capacity.

The United States Cast Iron Pipe & Foundry Co. is increasing the capacity of its plant at Buffalo.

The Gleason Co., of Rochester, N. Y., is constructing several new buildings, including a foundry 308 by 110 ft.

Wesley Patschke, of Lebanon, Pa., has commenced the erection of a new foundry. Mr. Patschke is a well known molder and has several others associated with him in the business.

The Dent Hardware Co., of Fullerton, Pa., has been making additions to its plant which will greatly increase its output. The company expects soon to enlarge its foundry building.

The Conway Steel Range Co., Toledo, O., recently incorporated with a capital of $100,000, will erect a building 30 x 120 ft. A finishing shop will be erected, and also a foundry, the dimensions of which will be 70 x 200 ft. The company's present structure in Auburndale, where ranges have been manufactured for the past year, will be enlarged 80 ft. so that the building will be 40 x 140 ft. Work on the improvements will be begun in a few days.

F. E. Myers & Bro., of Ashland, O., are preparing to build another foundry as an addition to their plant, which will greatly increase its capacity.

Leo Schwab, president of the Toledo Safe & Lock Co., of Toledo, O., is preparing plans

for a foundry addition to his plant at Glassboro, O.

The American Brake Shoe & Foundry Co., of Chicago Heights, Ill., has awarded the contract for a 2-story office building and for an extension to its steel foundry plant.

The Canedy-Otto Mfg. Co., of Chicago Heights, Ill., is making extensive additions and improvements to its plant, including a foundry building 60 x 80 ft.

The John C. Born & Bros. Machine Co., Belleville, Ill., which operates a machine shop, has purchased a plot of ground and will erect a plant of larger capacity. A foundry will be added to the plant.

The Detroit Steel Casting Co., of Detroit, Mich., has purchased additional land adjoining its present plant and is planning to erect a modern steel casting plant, the building being 165 by 400 ft. It is planned to install both open hearth furnaces and converters so that both processes of making steel can be followed. The improvements will double the capacity of the plant.

The Clayton & Lambert Mfg. Co., Detroit, Mich., will erect an addition to its foundry, 34 x 50 ft., and a 2-story boiler house, 34 x 60 ft.

The Beloit Machine Co., Beloit, Wis., has let the contract for the construction of a new pattern shop, which will cost about $25,000.

The building belonging to the Public Service Corporation, at Elizabeth, N. J., is being dismantled and the material will be used in the construction of a foundry which the company is building at Passaic, N. J.

The new plant of the Tennessee Stove Works, Chattanooga, Tenn., has been completed, and the first stoves were made this week. The new plant consists of three substantial brick buildings, electric power plant, stock and finishing, and foundry departments. The electric power plant will have a capacity of 80 h. p., and an engine made by the Harrisburg Foundry & Machine Works, Harrisburg, Pa., has been installed. The foundry building is 165 x 125 ft.

The Anniston Foundry & Machine Co., of Anniston, Ala., is to erect an addition 85 x 1,000 ft. for the manufacture of gas service boxes, soil pipe and fittings.

J. J. McDougal, of Mitchell, S. D., has purchased a site and will begin the erection of a machine shop and foundry building 50 x 80 ft.

The Iowa Malleable Iron Co., of Fairfield, Ia., expects to build an addition to its foundry and annealing room during the coming summer.

The Fremont Foundry, of Fremont, Neb., is being enlarged by an addition 20 x 40 ft.

H. E. Olbrich, of Cedar Falls, Ia., has his new foundry nearly completed.

G. W. Schmidt & Son, of Iowa City, Ia., are building an addition to their foundry and iron works.

The Pease Furnace Co., of Toronto, Canada, have taken out a building permit for a new foundry building to cost $25,000.

GENERAL INDUSTRIAL NOTES.

A company has been formed in Worcester, Mass., for the purpose of leasing the Arnold & Pierce foundry plant for a term of years, and operating it as a general foundry. The members of the company are: Alexander Hall and Alexander Rankin, who have been connected with the Holyoke Machine Co. Plans for opening the plant have been under way for about two weeks.

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., has acquired a controlling interest in the Waterbury Machine Co., of the same city.

Thomas A. Edison is sending out some very interesting matter concerning the cement made at his new cement plant at New Village, N. J. (Postoffice address, Stewartsville, N. J.) When Mr. Edison commenced the experimental work preparatory to the erection of his plant, he decided to try and make the best possible cement that had ever been produced. He claims that at least 85 percent of his cement will pass through a 200-mesh screen, as compared with about 75 percent of other brands. This means that a barrel of his cement contains 10 percent more of available active material than would be found in a barrel of ordinary cement. Accompanying the matter sent out by Mr. Edison there is a chart showing the curves obtained from actual tests of various classes of cement. The curve for the Edison cement was from nearly 1,200 tests during 1904. The results of the other tests are taken from the work of the Philadelphia Department of Public Works and include a large number of tests. In the chart referred to the curve for the Edison cement was well above all of the others.

The Kings County Iron Foundry, of Brooklyn, N. Y., has been incorporated with a capital of $75,000. The directors are Edward A. Calahan, Henry H. Schmittmann, Theodore L.

Herrmann and Margaret A. Loughran, of Brooklyn, N. Y.

The Crist Valve Mfg. Co., New York, is looking for a site with adequate shipping facilities and other inducements for the manufacture of a full line of brass gates and other valves for steam, water and gas. The machinery and tools have already been selected.

The Josiah Ross Mfg. Co., of Buffalo, N. Y., has been incorporated with a capital of $50,000, to carry on a general foundry and manufacturing business. The incorporators are Josiah Ross, Flora B. Ross, John Ryckman and John C. Kingston, of Buffalo.

The McKinney foundry, at Oberlin, N. Y., is again taking on a full force of men, and will operate its plant to its full capacity.

The Forest City Brass Mfg. Co., of Cleveland, O., has been incorporated with a capital of $75,000. The incorporators are John V. Kennedy, H. B. Sawyer, Geo. W. Shaw, Joseph E. Jackering and August G. Ilg.

The Norwalk Mfg. Co., of Norwalk, O., which two years ago succeeded the Norwalk Foundry & Machine Co., has in turn disposed of its foundry department to John Brooks. Aaron Townhill and Andrew Hamilton, of Cleveland, O.

The district offices of the American Steel Foundries, with plants at Pittsburg, Franklin, Sharon, Pa., and Alliance, O., will be moved from Alliance, O., to Sharon, Pa., on July 1.

The Columbus Machine & Foundry Co., of Columbus, O., at a meeting held May 10 elected the following officers and directors: W. C. Richards, president; E. T. Moore, vice president; A. Frederick, superintendent, and E. Hight, secretary. W. C. Richards, E. T. Moore, Joseph Donoghue, Walter Weaver and A. Frederick were elected directors.

Philip Metzger, who was foreman of the American Foundry Co., at Industrial Heights, Toledo, O., has purchased the interests of the various stockholders and will operate the plant.

The Dayton Pneumatic Tool Co., which recently took over the business of the Chicago Tool & Supply Co., is now located in its new plant at Dayton, O. Its present capacity is from 100 to 150 hammers per month though it expects to increase this in order to keep up with the demand.

The Champion Brass Works, of Coldwater, Mich., have commenced operations in a small way and expect to extend their business as fast as conditions warrant. They are fitted up to make brass, aluminum, copper and bronze castings, making a specialty of automobile work and plumbers' goods.

The Allyne Brass Foundry Co., manufacturer of goods for automobiles, has its new plant in Detroit, Mich., running full force.

The South Baltimore Steel Car & Foundry Co., of Baltimore, Md., which now has an authorized capital stock of $1,000,000, is planning to increase the capital stock in order to take care of its rapidly growing business.

Arrangements have been made for the consolidation of the Rock Hill Foundry & Machine Works with the Syleecau Mfg. Co., both of Rock Hill, S. C. The business will be carried on under the name of the latter company. Mr. G. A. Jones is the proprietor of the Rock Hill Foundry & Machine Works, and Messrs. W. S. Lee, Jr., J. B. Sykes and J. C. Cauthen are interested in the Syleecau Mfg. Co.

The Weatherford Machinery & Foundry Co., of Weatherford, Texas, has filed an amendment to its charter, by which it has increased its capital stock from $10,000 to $20,000.

The Gunther Foundry, Machine & Supply Co., of San Antonio, Texas, has filed an amendment to its charter changing its name to the Collins-Gunther Co.

The fire at the plant of the Stockton Iron Works, Stockton, Cal., April 19, was confined within the walls of the three-story brick pattern storage building, and did much damage to patterns. The remainder of the plant was not affected, and work in all other departments was resumed the following morning. The work of replacing the lost patterns will be pushed as rapidly as possible.

The J. W. Paxson Co., Philadelphia, Pa., manufacturer of foundry facings, supplies and equipment, celebrated recently its fiftieth anniversary. In 1855 the firm of J. W. Paxson & Co. was formed, and the business was successfully conducted under that name until 1897, when the J. W. Paxson Co. was incorporated under the Pennsylvania laws. At the present time the company manufactures almost all its foundry supplies and equipment, operates extensive molding sand banks and maintains a fleet of ocean barges for coastwise delivery. The officers are J. K. Bougher, president and general manager; Howard Evans, vice president; H. M. Bougher, secretary and treasurer; U. S. Hibbs, assistant general manager, and S. C. Bougher, purchasing agent.

Harry Haner, of Owego, N. Y., has installed a brass furnace in his iron foundry and is prepared to furnish brass castings as well as iron.

The Eaton, Cole & Burnham Co., of Bridgeport, Conn., maker of gas fittings, has been absorbed by the Crane Bros. Co., of Chicago, Ill. The plant will be enlarged and the working force increased.

The American Locomotive Co. announces that its general offices will be located in the Trinity building, 111 Broadway, New York.

Fuhrman Hardware & Plumbing Co., Elmira, N. Y., has been incorporated to manufacture hardware and hardware supplies. The capital stock is $25,000. The incorporators are: Harry K. Fuhrman, Burton Martin, W. W. Hervey, John C. Dyatt and Chas. S. Gary, all of Elmira.

The Benjamin S. Alder Co., New York City, has been incorporated to manufacture hardware, cutlery, etc. Capital stock, $20,000. The incorporators are: Benjamin S. Alder, 1162 Pacific street, Brooklyn, N. Y.; William W. Crowell, James Tongue, 37 Warren street, New York.

The Crest Valve Mfg. Co., New York City, has been incorporated to manufacture metals, valves, etc.; capital, $50,000. The incorporators are: William G. Green, William H. Bond, Brooklyn; Forbes J. Holland, New York City.

The Geo. A. Hogg Iron & Steel Foundry Co., of Pittsburg, Pa., has purchased several acres of land at Fourteenth street and the Belt Line R. R., Economy, Pa., and it is announced that the Vulcan Machine & Foundry Co. and the company above mentioned will unite and erect a new plant at Economy to cost in the neighborhood of $200,000. The merging of the two corporations has been completed and they will be among the first to locate at what has been planned as an industrial center.

Notice has been published that application will be made for a charter of an incorporation to be called the Urick Foundry Co., Erie, Pa., for the manufacture and sale of castings from iron or steel. The following persons are interested: Chas. H. Urick Sr., F. H. Dixon, Wm. J. Urick, Chas. H. Urick Jr. and Earle A. Urick.

The National Foundry Mfg. & Supply Co., of Williamsport, Pa., is moving into its new quarters, which were formerly used by the Larzalere Machine Co. The plant has been entirely remodeled and the size of the foundry increased by a large brick addition.

The W. W. Sly Mfg. Co., of Cleveland, O., are building a new shop on Train street near the Big Four tracks, which they expect to have ready July 1st. They report that they have booked as much work in the first four months of this year as they did in the entire previous year. Some idea of the work which they are doing may be had from the fact that they are now making tumbling barrels capable of cleaning castings weighing two tons each.

The Conway Steel Range Co., of Toledo, O., has been incorporated with a capital of $100,000, the incorporators being John Conway, John H. Fitzpatrick, Adam J. Ulrich, Grant L. Ulrich and Frank E. Ulrich. This company has been in business for some time and the incorporation is merely a change from a partnership to a stock company.

The Canton Stove Mfg. Co., Canton, O., recently incorporated, does not expect to begin active operations until early fall. The present expectations are that the company will adapt existing buildings to its purposes. The company has not yet made a complete schedule of its equipment, which will be similar to that of other modern plants for the manufacture of stoves. The company will manufacture a few special styles of stoves, which will be sold direct to the user. Earl V. Coulston, who will manage the business, has been for the past four years sales manager of the A. J. Lindemann & Hoverson Co., of Milwaukee, and previous to that was an assistant in the same line for the Cribben & Sexton Co., Chicago. His experience in the stove business began about 16 years ago at Royersford, Pa., where he served both the Buckwalter Co. and Floyd, Wells & Co.

Mr. A. P. Head, the London representative of the Wellman-Seaver-Morgan Co., of Cleveland, O., has just completed a tour round the world and has established the following subagencies for the Wellman-Seaver-Morgan Co. Melbourne, The Australian Metal Co., as Australasian agents, with the following branches; New Zealand, The Gilbert Machinery Co., Wellington; Queensland, James Stothert, Brisbane; N. Queensland, James Croker, Mackay; New So. Wales, W. R. Laidley, Sydney; So. Australia, James S. Fraser, Adelaide; W. Australia, A. E. Thomas, Koolgardie; Tasmania, Lindsey Tullock, Launceton,

In India the following agents representing the presidencies of Bombay, Bengal and Madras, have been appointed: J. Harper, Calcutta; Frank Harrison, Bombay; W. H. Oakes, Madras.

The National Furnace Appliance Co., Columbus, O., has been incorporated by M. S.

Seibert, E. S. Baldwin, G. F. Tinkman, L. T. Zimmerman and H. A. Clark. The capital is $25,000.

The Buckeye Foundry Co., of Cincinnati, O., is to be dissolved as a corporation and formed into a partnership by Wm. Gilbert and Chas. Lang, these two being the only remaining stockholders. The business will be conducted in future under the name of Buckeye Foundry.

The Mason Heater Co., of Bellaire, O., which has been in the hands of a receiver for some time, has its affairs straightened out and is to be reorganized with a capital of $25,000 under the name of the Mason Heater & Foundry Co.

The Electric Adding Machine Co., Cleveland, has been incorporated. The incorporators are: W. S. Rogers, M. R. Cox, C. W. Pattison, C. C. Wise and A. W. Mayers. Capital stock, $50,000.

The Loveland Foundry, Loveland, O., began operations recently with a force of fifteen men and expects to increase its capacity as the demand increases.

The Evansville Foundry Association, of Evansville, Ind., has been incorporated with a capital of $100,000. The incorporators are: Fred Eggert, Adam Jutzi and Chas. F. Diekmann.

The F. M. Hicks Locomotive & Car Co., Chicago, with plant at Chicago Heights, has purchased the plant of the Aermotor Co., of Chicago Heights, with the 20 acres of ground originally belonging to the plant and an additional 20 acres, giving ample room upon which to develop large car works. It is the purpose of the company to build and repair coaches and cars in the new plant, and enter more largely into the building and repairing of locomotives.

The Twin City Malleable Iron Range Co., of Urbana, Ill., is securing equipment for a foundry, so that it will be able to make all of its castings in Urbana.

The Commercial Club, of Menominee, Mich., is promoting a plan to sell $100,000 first mortgage bonds for the purpose of adding a steel casting plant to the works of the Prescott Co. in that city. There seems to be a good prospect that the bond issue will be subscribed by the people of Menominee.

The Capital Castings Co., Lansing, Mich., has been incorporated for the purpose of manufacturing castings and doing a general foundry business. The authorized capital stock of the company is $15,000, of which $8,350 has been subscribed.

The Lusk Foundry Co., Ltd., Grand Rapids, Mich., has been incorporated for the purpose of carrying on a general foundry and machine shop business. The company has an authorized capital stock of $10,000, of which $5,450 has been subscribed and $4,700 paid in in cash and $750 in property.

The Penn Foundry at Duluth, Minn., which has been idle for some time, is once more in operation casting pipe.

A. M. Sanders & Sons, of Reedsburg, Wis., have their foundry in good working order and are prepared to supply castings for local requirements.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Co., Jersey City, N. J., the old board of directors was unanimously re-elected. The board of directors re-elected the following officers: Edw. F. C. Young president; John A. Walker, vice president and treasurer; George E. Long, secretary.

The South Pittsburg Foundry Co., South Pittsburg, Tenn., maker of stoves, commenced operations on April 28. The officers of the company are: T. G. Garrett, president; A. A. Cook, vice president; and J. J. Bowers, secretary.

The Sheffield Cast Iron Pipe & Foundry Co., of Sheffield, Ala., has been organized with a capital of $500,000, $350,000 of which has been already paid in. The officers are: J. W. Worthington, president; W. U. Parsons, treasurer; J. G. Aderton, auditor; and J. W. Worthington, S. B. McTyler, and S. McGaughy, directors.

The foundry of the Hardie-Tynes Mfg. Co., of Birmingham, Ala., which was destroyed by fire March 12, has been rebuilt, with an increased capacity, and was placed in operation on May 1.

The New Bern Iron Works, of New Bern, N. C., has been incorporated with a capital of $20,000, by W. A. McIntosh, E. Williams and W. T. Brinson. The company intends to carry on a general iron foundry and machinery business.

The Johnson City Foundry & Machine Works, of Johnson City, Tenn., has been incorporated recently, with the following officers: G. W. Sitton, president; C. V. Cross, secretary and treasurer; and F. W. Baum, superintendent.

Ed. Hay, of Portage la Prairie, Manitoba, has sold his foundry to F. W. Clayton, and the latter has taken over the management of the plant.

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FOR SALE.—No. 10 Sturtevant fan, nearly new, in first-class condition. Address Box 995, BALTIMORE, MD.

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FOR SALE.—Brown Hoisting Buckets; four 5-ton, four 4-ton, five 3-ton, all in good condition. Immediate delivery. CAMBRIA STEEL CO., JOHNSTOWN, P.

FLUOR SPAR.—Every grade. Quotations delivered anywhere. Cheapest suppliers. Address GEO. G. BLACKWELL SONS & CO., Ltd., Liverpool, Eng., or agents Penna. Salt Mfg. Co., Pittsburg, Pa.

FOR SALE.—Foundry and machine shop complete, one block of ground all for $1,800. Reason for selling —old age. Address, C. Gilbert, 109 West Tenth street, Fulton, Mo.

FOR SALE.—$2,500 will buy interest in an established foundry. A good opportunity for an experienced man. Box 440, THE FOUNDRY, Cleveland, O.

BLOWER BARGAINS.
Roots Second-hand Blowers, bought, sold or exchanged for new ones. Address,
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120-122 Liberty street, New York City.

FOR SALE.—Iron manufacturing plant with cupola, blower, boiler, engine and shafting. Indiana town 100 miles from Chicago. Will sell at bargain. Address Box 429, THE FOUNDRY, Cleveland, O.

FLUOR SPAR.—We furnish best grades on the market. Ground lump or gravel. No order too small for our attention nor too large for our capacity. Prices on request. KENTUCKY FLUOR SPAR CO., MARION, KY.

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FOR SALE.—Two 10 ton Craig Ridgway & Son Steam Hydraulic Cranes; one 3 ton Craig Ridgway & Son Steam Hydraulic Crane; one 6 ton Farrel Foundry and Machine Co. Power crane; two 2,000 lbs. Brown Hoisting Machinery Co. Cranes; one 6,000 lbs. Yale & Towne Mfg. Co. Crane; nine 3,000 lb. Yale & Towne Mfg. Co. Cranes; one 2,000 lb. Yale & Towne Mfg. Co. Crane. Nearly all sizes solid and split cast iron pulleys from 10 inches to 8 feet 6 inches diameter. Nearly all sizes shafting and hangers. For further particulars and sketches inquire CHAPMAN VALVE MANUFACTURING CO, Indian Orchard, Mass.

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WANTED.—A superintendent for a stove foundry employing 200 molders. Address "Superintendent," care THE FOUNDRY, Cleveland, O.

WANTED.—An active, energetic man to take charge of cleaning-room in a stove foundry. Must be competent to inspect castings before leaving cleaning-room. Address "Cleaning-room Foreman," care THE FOUNDRY, Cleveland, O.

WANTED.—Foreman for small foundry. One who thoroughly understands manufacture of mine car wheels and locomotive castings. Must be thoroughly skilled in compounding iron for light and heavy castings. No union man need apply. Address, B. H. BIAYS, Cumberland, Md.

WANTED.—First-class man as foreman for Brass Shop located in a large Western city. We want a strictly first-class up-to-date man. One who is familiar with various makes of molding machines, also a good judge of human nature, and one that can control and handle men. Kindly state age and experience. Box 435, THE FOUNDRY, Cleveland, O.

Situations Wanted.

WANTED.—Position as foundry foreman, 15 years' experience. Heavy or light work; capable of handling large force; expert with cupola; mix by analysis. At liberty July 1. References. Box 437, THE FOUNDRY, Cleveland, O.

SUPERINTENDENT of Iron Foundry, with first-class references, wishes to change. Position wanted where brains, energy and temperate habits are appreciated. Mixing by analysis. Heavy and light machinery. Salary $2,000. East preferred. Box 443, THE FOUNDRY, Cleveland, O.

POSITION WANTED.—Am desirous of securing a position in a gray iron foundry in the capacity of general foundry clerk or assistant superintendent. Seven years' experience, understand mixtures of iron for good clean castings and loam work. Finest reference; trial wanted; any location. Address Box 436, care THE FOUNDRY, Cleveland, O.

WANTED.—Position as superintendent of grey or malleable iron foundry by man of 30. Wide experience on molding machines and piece work system. Understands the mixing of iron by analyses. Good references. Will purchase part interest in paying business. Address Box 426, THE FOUNDRY, Cleveland, O.

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Wanted.

WANTED.—One second-hand tumbling barrel for separate skimmings in a brass foundry. Box 439, THE FOUNDRY, Cleveland, O.

WANTED.—Set of pulley ring patterns and arms to make heavy and medium weight pulleys up to 26" in diameter. Address with full particulars and price, Box 441, THE FOUNDRY, Cleveland, O.

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Miscellaneous.

SAMPLES FREE.—Compo Crayons for marking castings, etc.; better and cheaper than talc. Address D. M. STEWART MFG. CO., CHATTANOOGA, TENN.

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1 1-16 inches thick, is used in our flasks which alone costs more than all of the material used in the ordinary flask.

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of the flask are machine locked, giving greater surface for gluing and a stronger joint than is possible to obtain from a dovetail or mitre.

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are of malleable iron. The snaps are without doubt the quickest snaps to operate.

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which protect the edges of both cope and drag are ½ x 1 inch wrought iron with WELDED CORNERS, which make the flask more rigid.

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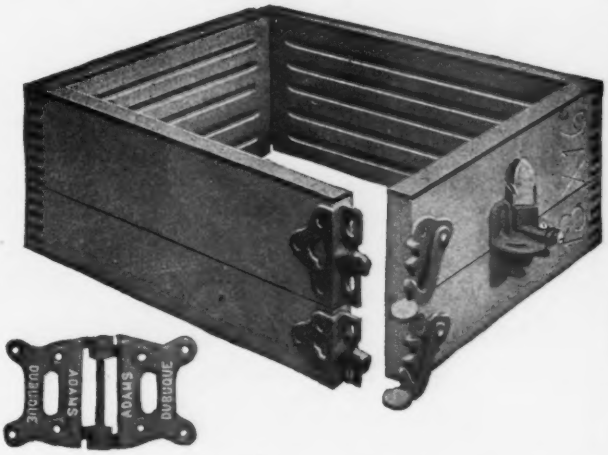
of malleable iron, with ¾ inch milled bearing on each side of the right angle. Fine adjustment in both ears is provided by means of a screw on the ends of the ears. Both ears being adjustable, cope and drag are easily kept in line.



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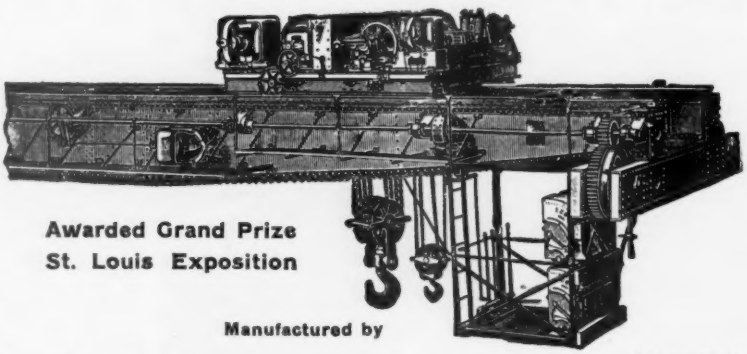

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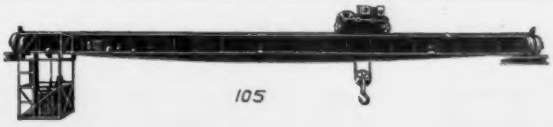

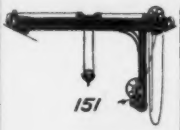

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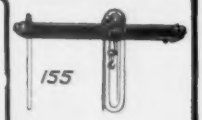
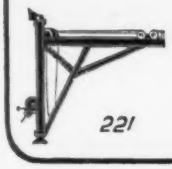
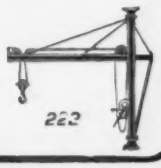
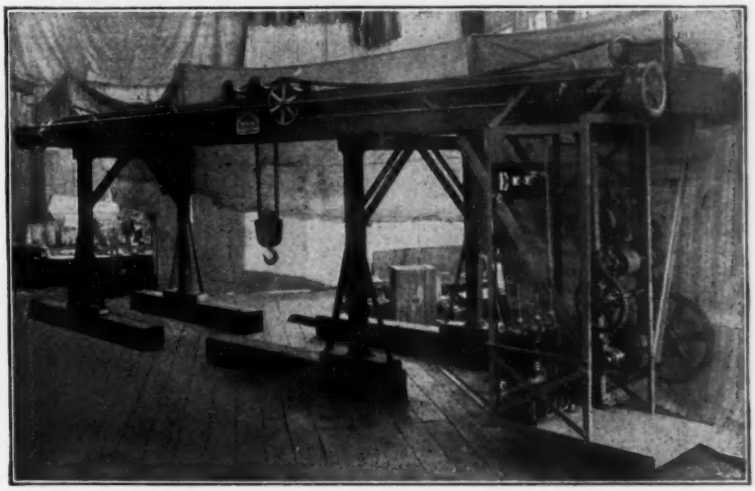






FOUNDRY CRANE



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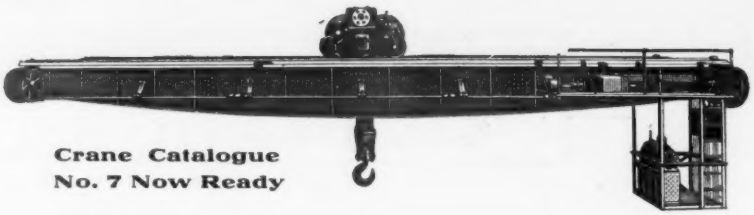

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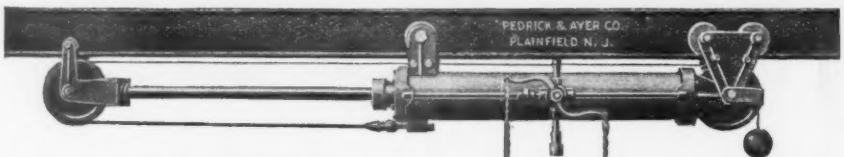

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that take up but little room, do the job quick and do it right. Your foundry can be equipped to handle all your flasks and castings for a small sum.

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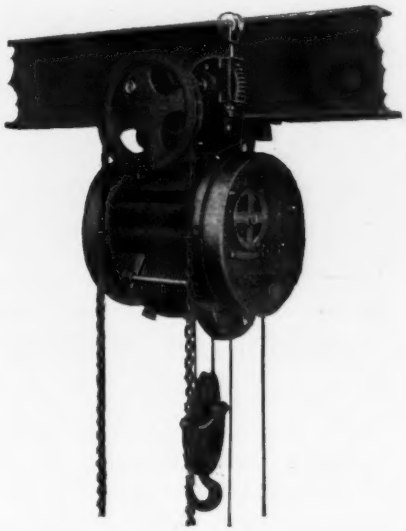

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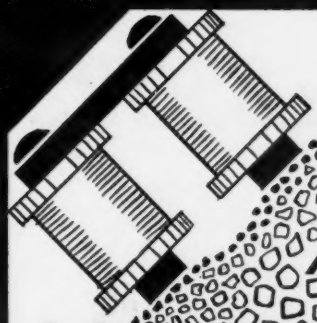

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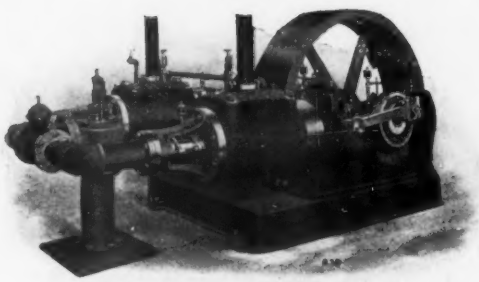

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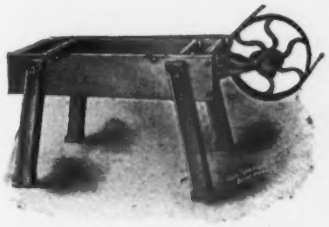

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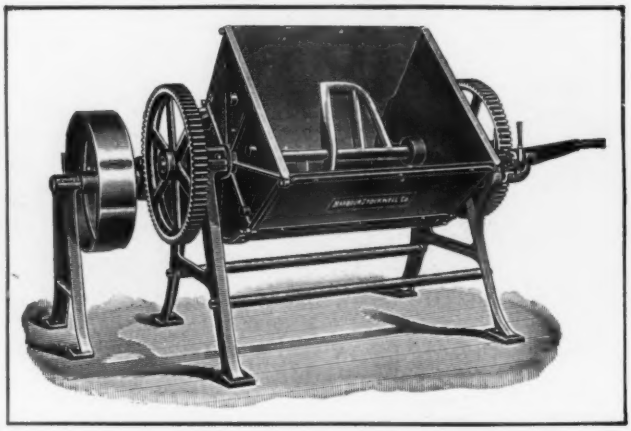

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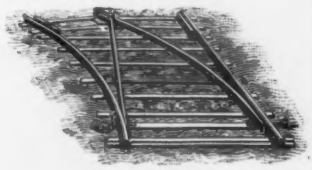

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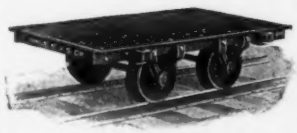

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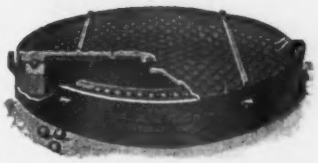

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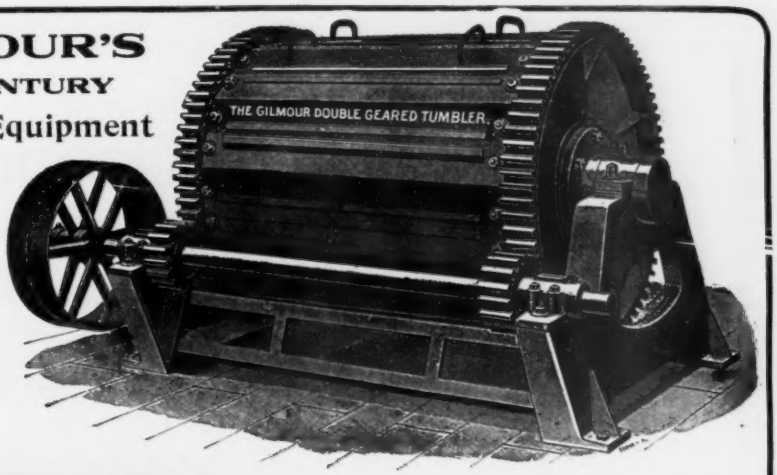

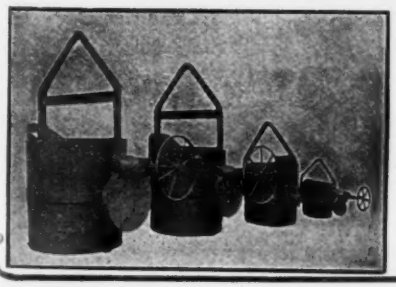

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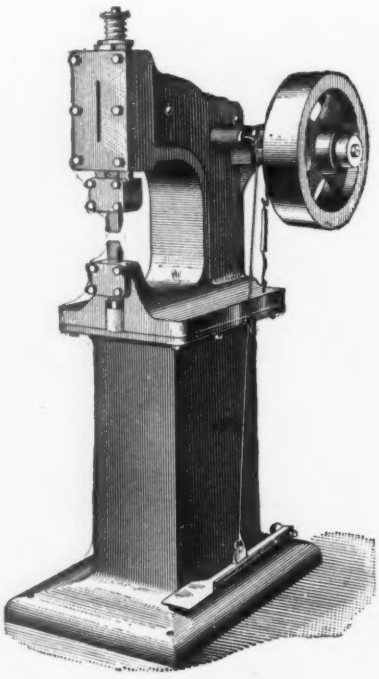

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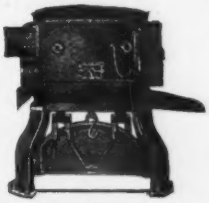

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The best and cleanest foundries are adopting it.

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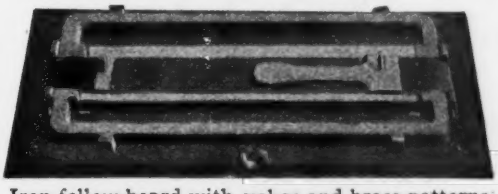
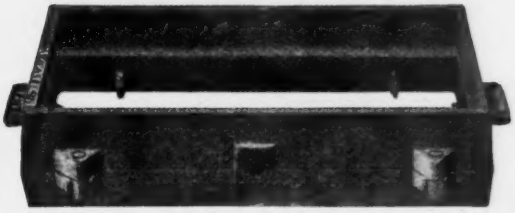


Iron follow-board with yokes and brass patterns for test bars ½" □ × 12" long.



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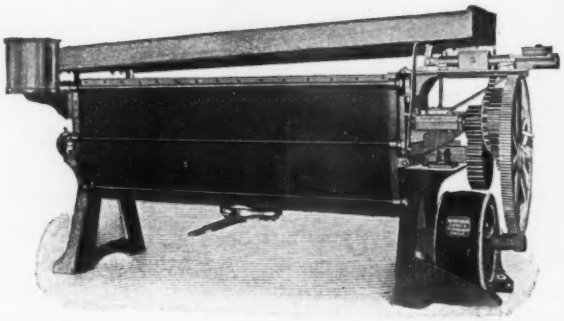

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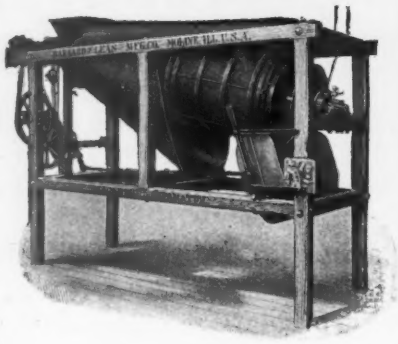

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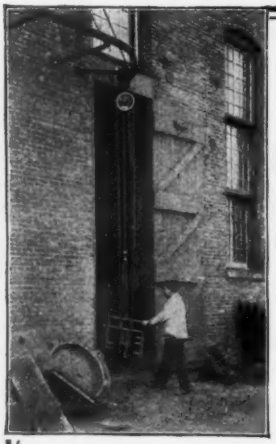

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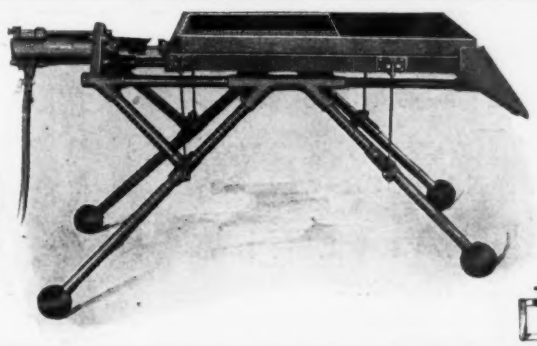

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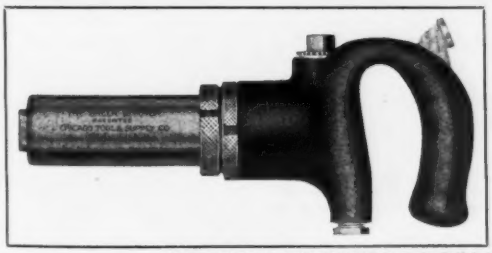

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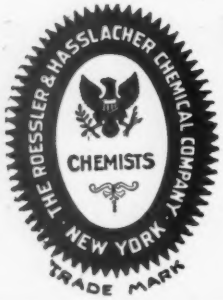

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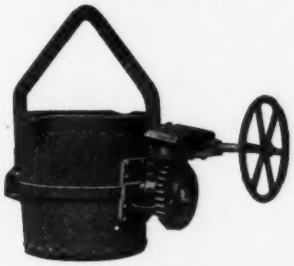

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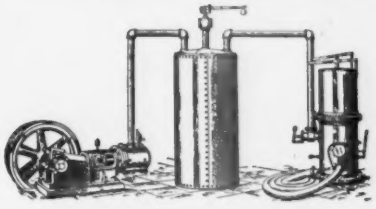

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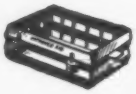

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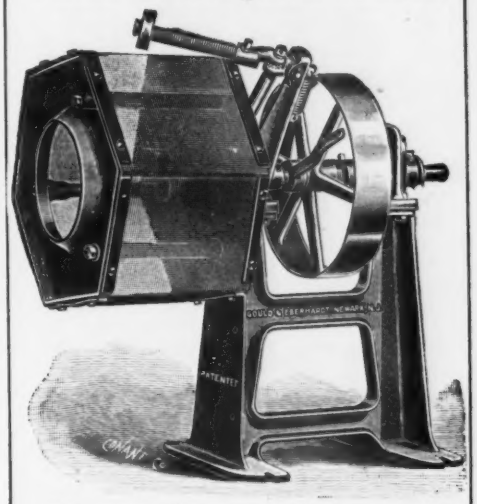

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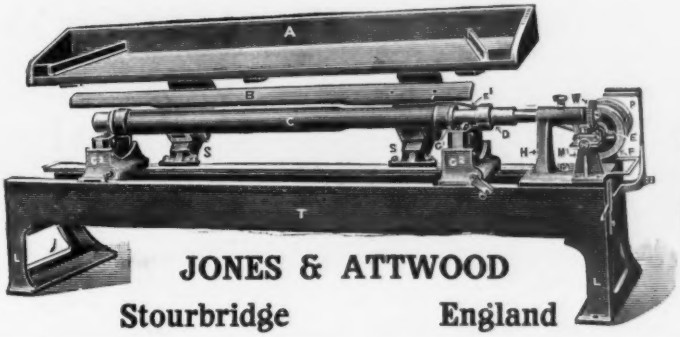

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We sell money-saving books on
FOUNDRY PRACTICE
Send for booklet.
The Foundry - - Cleveland, O.

CHAS. G. SHEPARD, PIG IRON
401 ELLICOTT SQUARE, BUFFALO, N.Y. & COKE.

ROBERT FIELD SALES AGENCY
Sloss, Florence, Lady Ensley, Sheffield
FOUNDRY PIG IRON
1101-2-3 Traction Bldg. CINCINNATI, OHIO

FIFTH PART

OF OUR

PIG IRON ENCYCLOPÆDIA

A Continuation of PIG IRON and COKE brands from last month.

Here is shown: Brand, Name of Furnace Company, Shipping point, Characteristics and other details.

HENRY CLAY—Empire Steel & Iron Co., Reading, Pa. Foundry and Forge Iron from Hematite and Magnetite ores of Berks and Lebanon Counties, Pa., with anthracite coal and coke fuel. Familiarly known over a wide territory as high phosphorus iron, running as it does in this element 2.50 to 3.50 per cent. Silicons, 1.50 to 4.50. Sulphur low. Popular for use in pipe mills, as well as making machinery castings. Sold by fracture or analysis grading. Capacity 60 tons daily.

HINKLE—Ashland Iron and Steel Co., Ashland Wis. Warm blast charcoal iron from all Lake Superior ores. Foundry, Malleable and Car Wheel. Foundry grades include Scotch and special grades for all kinds of cylinder work. Because of its established reliability and high grading, it forms the basis of more Malleable mixtures than any other Charcoal Iron. The chilling grades are sold only on fracture, but analysis is furnished if desired. Other grades on analysis guarantee only. Daily capacity 135 tons.

IROQUOIS—Iroquois Iron Company, South Chicago, Ill. Coke Iron made from a mixture of Lake Superior and Old Range ores, part of which come from the Company's own mines. Brands: Iroquois, Peerless, Sterling Scotch, low sulphur and high silicon, Foundry and Scotch grades. Malleable Iron a specialty. Sales made by analysis or fracture grading. Capacity 550 tons daily.

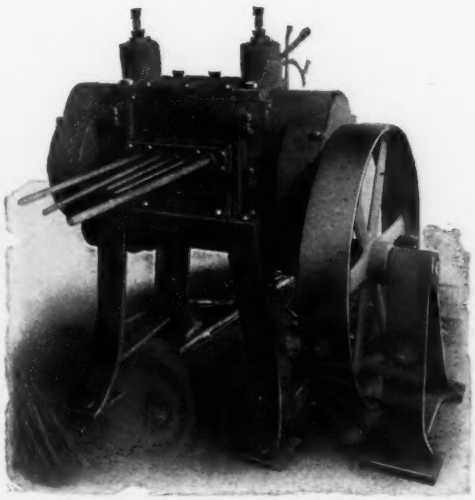
JEFFERSON—Jefferson Iron Company, Jefferson, Texas. Charcoal Iron of recognized high grading and reliability, in both chilling and foundry grades. Low in Phosphorus. Very strong and dark in color. Chills deep and wide. Foundry iron is soft and strong. Applicable for all purposes where a superior charcoal iron is necessary. Sold by chill grading or analysis. Capacity 50 tons daily.

(To be Continued)

Rogers, Brown & Company

Cincinnati New York Chicago Buffalo St. Louis
Philadelphia Cleveland Boston Pittsburg Birmingham

Climax Core-Wire Straighteners



MAKE OLD MATERIAL
AS GOOD AS NEW

Much material often thrown away can be saved and core-makers' time can be saved by a machine which straightens ¼", ⅜" ½", ⅝", and ¾" wires as fast as a boy can feed them in.

Write for Bulletin F

GEO. F. BLAKE MFG. CO.
114 LIBERTY ST.
NEW YORK

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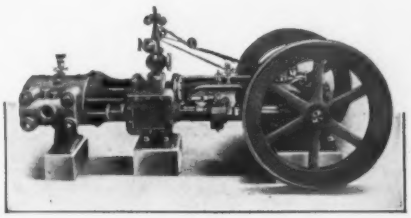
CLAYTON CLIMAX AIR COMPRESSORS

ARE ADAPTED TO ROUGH USAGE

THEY have rigid fork frames, adjustable cross-head slippers, center crank construction and a single extra heavy connecting rod. The main shaft bearings are so far from the steam cylinder that they never are put out of adjustment by radiated heat.

Write for book C201F



CLAYTON AIR COMPRESSOR
114 Liberty St., NEW YORK

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All Salaried Men

IF your molders and helpers are all salaried men, then what we have to say may not interest you so much; but if they are paid by the hour and you are not using a Rotary Blower, we think we can show you how you might lessen your pay-roll and also increase your profits. ¶ No doubt you have read the report of the test recently made at Pittsburg, between a Connersville Positive Pressure Blower and a Fan. Did you notice that the Connersville Blower under the same conditions melted one ton more of iron in 57 minutes (practically one hour) less time than the fan? What would that mean in your foundry? ¶ Suppose you employ 30 men, paying them an average rate of 22c. per hour—you run three heats per week and each time by using a Connersville Blower you save one hour. The result would be that you could not only increase your capacity but you would save in your pay-roll

$1,029.60 PER YEAR

Ask us questions

CONNERSVILLE BLOWER CO.

Eastern Office, 95 Liberty St., New York City

Home Office

CONNERSVILLE, INDIANA